AMERICAN AVIATION

October 20, 1958

First Annual Naval Aviation Issue

AMERICAN AVIATION

OCTOBER 20, 1958—VOL. 22, No. 11

WORLD'S LARGEST AVIATION PUBLISHERS

Contents

FIRST ANNUAL NAVAL AVIATION ISSUE

Regional Offices: New York City: 17 East 48th St., New York 17, N.Y., Robert Weston and Frederick W. Pratt, regional advertising managers. Phone: Plaza 3-1100. **West Coast:** 8929 Wilshire Boulevard, Beverly Hills, Calif. Fred S Hunter, manager. Phone: Oleander 5-9161 and Olympia 7-1555. **Canada:** Allin Associates, 12 Richmond Street East, Toronto 1, Ontario. Phone: Empire 4-2001. Allin Associates, 1487 Mountain Street, Suite 4, Montreal, Quebec. **Chicago:** 139 N. Clark St., Chicago 2, Ill. Richard K. Helwig, regional advertising manager. Phone: Central 6-5804. **Detroit:** 201 Stephenson Bldg., Detroit 2, Mich. Phone: Trinity 5-2555. Kenneth J. Wells, regional advertising manager. **Cleveland:** 244 Hanna Bldg., 1422 Euclid Avenue, Cleveland 15, Ohio. Phone: Prospect 1-2420, Donald E. Murray, regional advertising manager. **Florida:** 208 Almeria Ave., Coral Gables, Fla., Richard D. Hager, sales representative. Phone: Highland 4-8326. **Geneva:** American Aviation Publications, 10 Rue Grenus, Geneva, Switzerland. Anthony Vandyk, European director. **London:** The AAP Company, 17 Drayton Road, Boreham Wood, Hertfordshire, England. Phone: ELStree 2688. Cable Address: STEVAIR, London. **Paris:** Jean-Marie Riche, 1 Rue Condorcet, Paris (9e). Phone: TRU 15-39. Cable Address: NEWS-AIR PARIS.

Publishing Information: Published every other Monday by American Aviation Publications, Inc., Washington, D.C. Printed at The Telegraph Press, Harrisburg, Pa. Application for acceptance as controlled circulation publication pending at Washington, D.C. and Harrisburg, Pa.

Member, National Business Publications

Editorial and Business Offices: Lawrence L. Brettner, Circulation Director; Frank R. Williams, Circulation Fulfillment Manager; George F. Peterson, Research Manager; Fay D. Crowley, Advertising Service Manager; Stephen A. Rynas, Advertising Promotion Manager; William H. Martin, Art Director; Frank F. Kozelek, Ass't Art Director; John Walen, Production Manager; Elsie Gray, Ass't Production Manager. 1001 Vermont Ave., N.W., Washington 5, D.C., U.S.A. Phone: Sterling 3-5400. Cable: AMERAV.

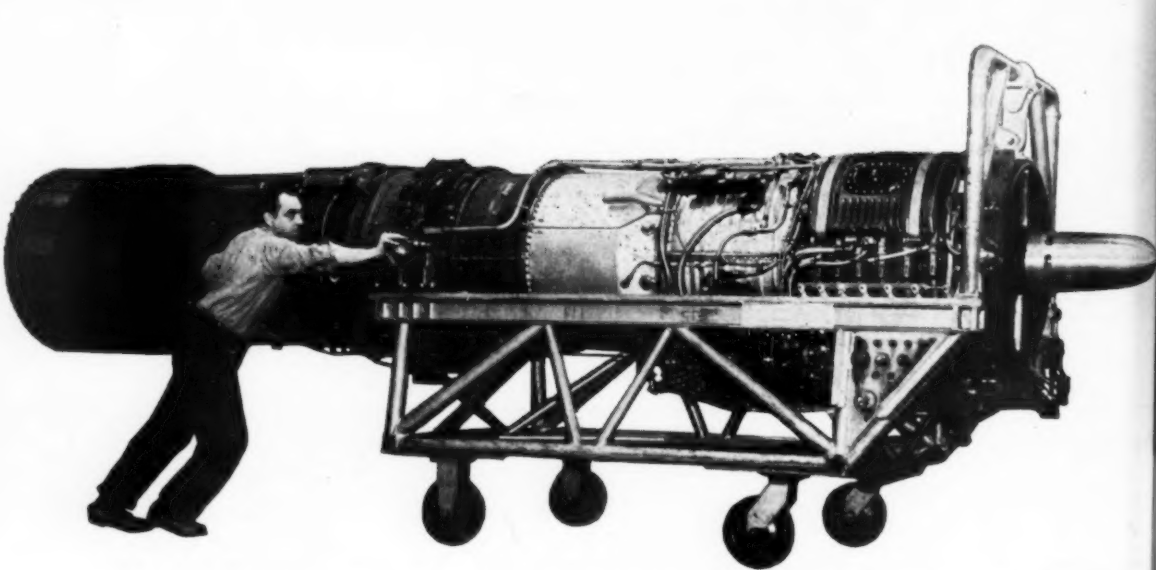
Subscription Rates: Single copies—$1.00. For U.S. and Canada—$10.00 for 1 year. Other countries—$15.00 for 1 year. Subscriptions limited to aviation industry personnel.

Incorporates: Airports and Air Carriers; Aviation Equipment; The American Pilot; Aviation Sales & Services; U.S. Aviation; American Airports and Airports & Heliports. All rights to these names are reserved.

Change of Address: Send old address (exactly as it appears on mailing label on your copy of magazine) and new address, including zone number if any to American Aviation, 1001 Vermont Avenue, N.W., Washington 5, D.C. Allow two weeks for change.

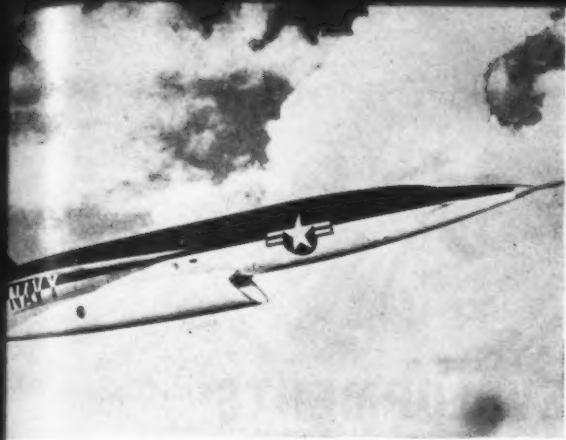
NAVY NORTH AMERICAN A3J

NAVY McDONNELL F4H



GENERAL ELECTRIC'S HIGH THRUST, LIGHTWEIGHT **J79**

Power for America's New "Mach 2 Family"



NAVY CHANCE VOUGHT REGULUS II

NAVY GRUMMAN F11F-1F

USAF CONVAIR B-58

USAF LOCKHEED F-104

Each designed for a special defense mission, America's "Mach 2 family" (above) has one thing in common: General Electric J79 power for Mach 2 performance.

Lightweight and powerful, the J79 provides . . .

- 15,000 pounds thrust for Mach 2 speeds.
- total engine weight of about 3200 pounds to give J79 highest specific thrust of any large turbojet in production today.
- 12:1 compressor pressure ratio allows excellent fuel economy at both subsonic and supersonic speeds.

J79-powered U.S. Navy and U.S. Air Force aircraft are consistently exceeding performance expectations. Recently, the F-104/J79 (bottom, right) returned the world's altitude record to the United States, climbing to a height of 91,249 feet. Then, another F-104/J79 surpassed the world's existing speed record by nearly 200 mph, speeding at 1404 mph.

America's J79-powered "Mach 2 family" demonstrate why lightweight, high thrust powerplants hold the key to new performance standards for U.S. aircraft. And right now, J79 experience is speeding development of General Electric's newest turbojet—the J93—designed to power Mach 3 aircraft and missiles of the 1960's. General Electric Company, Cincinnati 15, Ohio.

235-30

Progress Is Our Most Important Product

GENERAL ELECTRIC

Circle No. 104 on Reader Service Card.

Circle No. 106 on Reader Service Card.


Known to the ancient Greeks as Hermes and to the Romans as Mercury, this statue by Giovanni di Bologna remains a universal symbol of speed in the modern world.
CONVAIR JET-LINER
MASTERPIECE OF Speed
The jet-age traveler will look to the Convair Jet-Liner as the newest symbol of winged speed! Cutting today's travel time in half, Convair's 880 and 600 Jet-Liners, with a cruising speed of 615 miles or more, will be *the world's fastest jet passenger planes!*
CONVAIR
A DIVISION OF GENERAL DYNAMICS CORPORATION
First to offer Convair 880 or 600 Jet-Liner service will be TWA, DELTA, TRANSCONTINENTAL (Argentina), REAL-AEROVIAS (Brazil), and AMERICAN

AIRTRENDS

More delays can be expected in the plans to reorganize the research and engineering organization of the Defense Department. Need still exists to find a "big-name" willing to take on the new position of director of research and engineering and with it the hot job of trying to umpire the research programs of the Advanced Research Projects Agency as an operational unit, the Office of Guided Missiles and the Army, Navy, and Air Force. Despite earlier hopes, indications are that Defense Secretary McElroy still hasn't found a man willing to take on the almost impossible responsibility.

Fiscal 1960 defense program will be as tight as international conditions and public opinion will permit. Reason is that FY 1960 obligations will determine Defense Department expenditures in fiscal 1961 when the Administration wants a balanced budget at almost any cost.

Whether the program can be limited to hold spending within $42-odd billion will depend to a large extent on whether an honorable retreat from "the brink" can be arranged in the Far East and whether the public is satisfied with technological progress now bolstered by the launching of the AF's first lunar probe.

Modernization of airlift may be a victim of the economy wave now shaping up. Deputy Defense Secretary Donald A. Quarles told a news conference last week that General Nathan F. Twining, chairman of the Joint Chiefs of Staff, had recently indicated that airlift capability was more than adequate to handle the Lebanese requirements. On the question of modernization, Gen. Twining said: "I will agree that our airlift capability needs modernization. Similarly, the Army modernization program should be pushed, the Navy's obsolescent ships should be replaced, all F-86's should be replaced by Century series aircraft and so on . . ."

Growing interest in the nuclear powered aircraft as a reconnaissance plane of the early warning type may result in the revival of AF contracts with Pratt & Whitney who are still working on a reactor for the Atomic Energy Commission. This the planners think might solve or help to solve some of the headaches inherent in the current situation where General Electric Company has the sole contract for development of the propulsion unit.

Maintenance policies of the Air Force are in the process of change. IRAN will now mean inspection, repair as negotiated with the using service and the Air Materiel Area rather than "inspection, repair as needed." Net effect will be less work on each aircraft by the AMA but AF hopes to cycle aircraft through the AMAS and into the contract maintenance shops more frequently. Change in policy is aimed at cutting down time on first line aircraft for which field maintenance and AMA maintenance is taking the principal responsibility. Maintenance shops can expect to take a cutback in work as a result of the reaffirmed decision to continue to assure AMA repair capability.

DOD will take a look at the operations of the Aircraft Production Resources Agency and the Electronic Production Resources Agency as part of the plan to get rid of unnecessary committees and agencies. Both are joint agencies of the Air Force and Navy created first during World War II to act as claiming agencies for controlled materials (steel, copper and aluminum mill forms and shapes). APRA also has authority to schedule production of "B" products (common components) to assure availability to meet end product production schedules.

Air force will reserve the right to make changes in industry teams created for new weapon systems. All the signs are pointing to a plan to "share-the-wealth" to assure the maintenance of as many aircraft plants as possible for use in the event of a future emergency. This may mean that as between two potential team members, one loaded with work, and the other with little work in the plant, the nod would be given the company that is short on work, all other factors being equal. Under this policy, Douglas can be expected to get the contract to engineer and develop the B-70 wing for its Tulsa plant.

AIRTRENDS

Lockheed's CL-410 turboprop with Model 1649 wing, Electra body and twin tail is going to face stiff competition from two Douglas divisions in USAF's airborne early-warning and control competition. This also means the two Douglas divisions will be competing with each other for the order. Douglas-Santa Monica is preparing a proposal for a turboprop version of the DC-7 and Douglas-Long Beach is coming in with a version of its turboprop C-133. All of the planes will carry big, 360-degree rotordomes similar to the parasol radome pioneered by Lockheed in the Navy W2V.

North American Aviation made two important discoveries the hard way on the first flight of the twinjet UTX Sabreliner. Three flameouts were experienced on the initial flight. But NAA pilots learned that General Electric's J85 engine is readily restarted in the air and also that the Sabreliner requires no change in trim when it loses an engine.

Convair B-58 Hustler is going through its climatic trials at Eglin AFB, Fla. Tests are being run between 65 below to 165 degrees above zero. The B-58's pod, which can be used either as a bomb or carrier for electronic countermeasures, also is undergoing climatic tests.

Beech Aircraft has made its first Travel Air transpacific delivery flight. Four-place, twin-engine aircraft was flown from San Francisco to Manila via Hawaii, Wake Island and Guam. It was fitted with extra fuel tanks for the 7,772-mile trip. Longest nonstop leg was 2,395 miles to Hawaii.

Some indications of a return to normal economy can be seen in the sales tallied up by exhibitors during the recent American Society of Tool Engineers Western Tool Show at Los Angeles. On the spot sales of tools, accessories and equipment added up to an estimated $4 million, show officials reported.

Douglas keeps putting back first flight of its second DC-8 with the J57 engines in order to complete fixes and make changes. It now is scheduled for late November or early December. One of the time-consuming changes causing delay is installation of the new sound suppressor-thrust brake ejector system. Leading edge flaps, to compensate for the new 422A regulation, may also be included in this airplane. Douglas flight-test officials take the position that more can be accomplished by waiting for fixes that are known to be coming than to fly an airplane simply to pile up hours on it. The first DC-8 with J75 engines, however, won't wait for the new sound suppressor-reverser and should be ready to fly late this month or early next.

Westinghouse scientists have come up with a new ultra-sensitive detector that can respond to less than one-twentieth of a billionth of a watt of infrared radiation. One of a variety of military tasks this sensitive instrument may be used for is detection of fast-flying aircraft.

Lockheed figures that by watching costs during the Electra demonstration tour to Europe, Asia and the Middle East, the total bill for the 55-day jaunt will be about $225,000. But it won't all come out of Lockheed's pocket. Allison Division of General Motors, manufacturers of the Electra powerplant, will pick up the check for about one-third the overall cost.

There are indications North American Aviation may be looking ahead toward development of a Mach 3 commercial transport. While NAA has consistently stuck to military business, there are some industry observers who view a recent talk by Lee Atwood, company president, as indicating interest. Atwood made some significant comments regarding the values of a 2,000-mph intercontinental air vehicle. NAA is working on such a vehicle in the B-70 bomber, but Atwood also noted that as a transport it "promises to revolutionize the long-distance moving of passengers and cargo, and will represent probably the greatest single forward step in the history of transportation." While that is commercial language, it is doubtful NAA would undertake it without a 2,000-mph military transport first.


XV 719

SAFE FLIGHT
SAFE LAUNCHING
Missile System Connectors . . . For Safety in Flight
Thousands upon thousands of Cannon "standard line" connectors are being used today in missiles of all types. They are noted for the "something extra," the quality, and the reliability Cannon builds into each and every one. More than 27,000 different items to meet your every need. For a brief introductory coverage, write for the New Cannon Plug Guide, Bulletin CPG-3.
"Unit-plug-in"
CANNON ELECTRIC
Please Refer to Dept. 404
CANNON PLUGS
Cannon Electric Company, 3208 Humboldt Street, Los Angeles 31, California • Factories in Los Angeles, Salem, Massachusetts, Toronto, Canada, London, England, Melbourne, Australia. Manufacturing licensees in Paris and Tokyo. Representatives and distributors in all principal cities.

Salute To Naval Aviation

This is the 50th Anniversary of Naval Aviation. Perhaps not in any "hardware" sense as were the celebrations five years ago of the Wright Brothers first flight or last year's Golden Anniversary of the Air Force, but just the same, 1958 is a true Naval Aviation anniversary. It is the anniversary of a concept born of the 1908 suggestion by then Assistant Secretary of Navy Theodore Roosevelt that the Navy investigate Professor Langley's "flying machine."

And although it wasn't until 1912 that the Navy asked for and was voted its first aircraft procurement money—$25,000 for one Wright and two Curtiss 45-mph aircraft—the concept of U.S. Naval Aviation was born in 1908 and has prospered over the past 50 years to become the third largest air force in the world.

It is on this fitting note that AMERICAN AVIATION publishes its First Annual Naval Aviation Issue.

Naval Aviation today is a power, a far cry from what was envisioned in this humble beginning. Today Naval Aviation is a carrier-borne attack force second to none in the world; it is a barrier patrol mission against enemy submarines; it is a Marine air arm; and perhaps above all, a vital element of U.S. airpower. And its achievements in all of these areas are a true testimonial to a broad segment of the aviation industry that has played a key role in making Naval Aviation what it is today.

At a quick glance over the past, the present and future there come to mind the contributions of Chance Vought with its Cutlasses and now Crusaders, Convair with its PBYs and now the R4Y, Douglas with a host of models in the ADs, A3D, A4D, F4D. There are the Fairchild R4Q transports for the Marines and the Goodyear Aircraft lighter-than-air series up through the new radar-carrying ZPG-3W; and Grumman too numerous to recite but now exemplified in the F11F Tiger, the TF-1, W2F and upcoming A2F.

But this is not all. We have Lockheed with the P3V version of the Electra to follow the P2V and R7V and its GV-1 model of the C-130 to go to the Marines. There is Martin with the P6M SeaMaster, its Mars of the past eclipsing a long line of flying boats. Then McDonnell with its Banshees and the new F4H, North American-Columbus with its T2J and A3J now entering the scene, not to overlook the Furies that preceded them. And there is a newcomer to the Navy in Temco with its TT-1 Pinto jet trainer.

Then there are the engine producers that made these developments possible, Pratt & Whitney, General Electric, Westinghouse, Curtiss-Wright, Allison, Continental and others. This is a brief but impressive review of the hardware that has built and is still building the role of Naval Aviation and of the companies that have made this hardware possible. A complete roster could not be contained within the bounds of this page.

In this, the First Annual Naval Aviation Issue, the editors of AMERICAN AVIATION depict in detail the background of Naval Aviation, why it is and what it does. Upon this firm foundation, it is our plan to bring Naval Aviation into sharper focus in such an issue each year. As with the First annual Army Aviation issue introduced on March 10 of this year, this feature issue on Naval Aviation represents a reaffirmation and strengthening of our editorial policy in the interest and cause of things *aviation*.

FAA Should Move Fast

The appointment by President Eisenhower of E. R. "Pete" Quesada to head the Federal Aviation Agency is a major break for aviation. There is much to be done in all too little time and no one on the scene has been closer to the task at hand.

But Quesada cannot do it alone and past reluctance on the part of industry in general to produce some much-needed talent to fill key positions in Airways Modernization Board should be re-examined. Whispered criticisms of the large numbers of military or civilians from former Defense jobs employed by Quesada to date in AMB are a poor substitute for action.

There is still need in AMB and there will be need in FAA for some topflight talent from industry with solid operational and administrative knowhow. But it's up to the aviation industry to act now. If it passes up this opportunity, any criticisms that may develop in the future should rightly be classed as too little, too late.

A Glaring Weak Spot

The behind-the-scenes intrigue, political pressures and downright incompetence that has forced the suit by Aeronautical Radio, Inc., Air Transport Association, an electronics manufacturer and three airlines to protect their rights on Doppler radar and anti-collision radio frequency assignments is a severe indictment of the weakness of the Federal Communications Commission.

But it is not all the FCC's fault. Congress has let its own agency down and has exposed it to the dictums of more powerful bodies in the executive branch. As a result, military equipment planners have run roughshod over the frequency spectrum, first with Tacan, now with new radar equipment, then backtracked at a point too late in the development cycle to have lawful occupants of these bands dispossessed. Even the terms of an International Treaty appear no obstacle to these pirates and should be erased rather than have them admit to an error in Defense management.

The U.S. has lost a lot of face on the international scene as a result of the Tacan controversy but it will lose even more if something is not done soon to make FCC more than a tool of the Office of Defense Mobilization on radio frequency matters.

Joseph S. Murphy

The regular editorial contributor to this page, Wayne W. Parrish, is currently on an extensive trip through Europe, Poland, the Soviet Union, Afghanistan, and India. In his absence the page will be written by Joseph S. Murphy, Executive Editor.

← Circle No. 107 on Reader Service Card.

"In nearly every facet of naval operations, we see now and foresee in the future the manned airplane as an ever-important link in the chain of naval strength."

Asst. Secy. of Navy (Air)
Garrison Norton

The U. S. Navy and . . . The Manned Airplane

In recent days the fascination of space and the enormous threats of ballistic missiles have made it fashionable for the popular imagination to forecast the imminent demise of the manned aircraft as an instrument of military power. We in the Navy are convinced that more and more of both the offensive and defensive power of the United States must move off our shores and into that two-thirds of the globe which constitutes the ocean areas of the world, where we do not infringe on the sovereign rights of other nations, and where enemy strikes at our weapons do not put our own cities in the target's bullseye. The manned aircraft will be a vital element of these forces at sea.

The key to our use of the seas to push the offensive and defensive frontiers of the United States into the ocean spaces lies in our ability to control and exploit the sea.

The Navy, with the Marine Corps, is a ready force. With elements of this force deployed at sea around the world, it is a power ready for instant action in any of a wide variety of places and circumstances. The presence of these forces, "showing the flag" in the trouble spots of the world, adds heavy weight to the pressures deterring all types of war. The fast reaction time of these on-the-scene forces can keep the limited conflicts, which constitute the most likely threat to peace, from growing into the thermo-nuclear exchange which would jeopardize our civilization.

Among the principal elements of Navy striking power are the attack carrier forces and the amphibious groups, tailored for action in limited war. The manned airplane will continue to be essential to these forces. There is no weapon development in sight which will replace the piloted attack airplane for precise discriminating delivery of the needed firepower under changing tactical situations and in the support of troops. Marine vertical envelopment techniques add a new dimension to amphibious assault. Unfettered from land bases near the theater of action, naval forces provide the only airpower available for these tasks in many areas of the world.

These air forces, flexible and mobile, are sufficiently versatile to provide a significant assist to the missile-firing submarines, the long-range missiles and our strategic air forces in the thermo-nuclear retaliatory role. Difficult to pinpoint, able to launch attacks from a wide variety of positions, carrier striking forces must be an item in the Kremlin ledger on the side of holding back the nuclear exchange.

A formidable challenge to our control of the seas and to the safety of our cities is posed by enemy submarine forces. Missile-carrying submarines can menace the United States; antishipping submarines can threaten the freedom of the ocean highways for surface vessels. The Navy faces one of its primary tasks in finding, tracking and countering this threat.

The Navy's battle against submarines is a tough and unglamorous job—and one of those most important to the Navy and most vital to the security of the Nation. The antisubmarine war is one of unceasing vigilance, patrol, search and analysis. The airplane is an essential member of the air-surface-underwater team engaged in antisubmarine warfare, no one of which can do the job alone. In order to kill or counter a submarine, naturally it must first be found. The miles of empty ocean space which must be kept under surveillance require a vehicle which can search at a high rate—an airplane. The importance of following up a contact with minimum time delay after it is made requires high speed in the vehicle sent to the contact point—an airplane. These are portions of the antisubmarine problem that can be solved only by an airplane. In this role alone we shall have airplanes for many years to come.

These are but a few of the specific areas in which we of the Navy feel that the manned airplane will be indispensable to our operations.

In nearly every facet of naval operations, we see now and foresee in the future the manned airplane as an ever-important link in the chain of naval strength. Naval aviation is ready now for today's tasks; it will be ready in the future for tomorrow's tasks. To this end naval aviation programs stress modernity. Our equipment must keep pace with the swiftly advancing technology of the industries that supply us—sometimes at the expense of the quantities we would like, for improvements in capability do not come cheaply.

Only so long as the seas are free for our use, only so long as we can control and exploit them, will the sea-lanes be the ties with our friends. Most of the noncommunist nations of the Free World border on the seas, the seas that join us with these nations in commerce and communication in peace and bind us together in war. Supplied by American industry and supported by an informed public, the Navy will succeed in this task.

I am pleased that this issue of AMERICAN AVIATION magazine devoted to U.S. Naval Aviation provides an opportunity to tell the story of naval air, where we are going with this unique and potent force and how we intend to do our job.

Naval Aviation . . .
The Heart of Today's Fleet

Since the days of John Paul Jones it has been the Navy's mission to ensure the use of the seas for our own purposes and for those of our Allies and in time of war to deny the use of the sea to our enemies. The principle of keeping the seas free depends on the ability to mount the most modern weapon of the day on a ship. This fact has been true through the eras of the ramming prow, the sword, the musket, the smooth bore cannon, the high powered naval rifle and, finally, the delivery of destruction by naval aircraft. It will extend into the day when guided missiles become predominant.

Today, the Carrier Task Force provides the principal offensive means for carrying out the Navy's mission of maintaining general sea supremacy—a supremacy essential to the support of our Allies in overseas areas and necessary for safeguarding imports for our domestic economy.

• Self-contained capability—The Carrier Task Force is the only existing weapons system which has the self-contained capability of projecting the required air superiority to any part of the sea and to any overseas areas from which an enemy can threaten our full use of the seas. It is pertinent to observe in this connection that the Carrier Task Force provides mobile air bases which are sovereign territory of the United States, and its operations therefore are not dependent on agreements or collaboration with foreign governments.

Regardless of any other capability they may have, the mobile air power of the carriers is required for employment against strictly naval objectives, such as enemy submarine, surface, air and guided missile forces and bases which threaten our own sea communications or those of our Allies; for direct support of amphibious operations; and for defense of the forces after landing. These are considerations which dictate the requirement for carrier-based air power. It may also, however, be used to apply precise and discriminating mobile power at any point where the employment of land-based air might be less effective, less economical, delayed for lack of bases, or impossible.

It is highly pertinent to point out that the United States today, with its aircraft carrier forces, possesses the bulk of the mobile air striking power of the free nations. The British, French and Australians contribute a relatively limited amount. Here is represented the present sum total of the mobile air power available to counter an aggressor. Our present carrier-based air power, therefore, constitutes not only a powerful addition to our united arsenal, but a unique one as well, whose tasks cannot be accomplished by any other service.

Carriers have, in addition to mobility, another characteristic which is not widely understood. This is versatility, the capability of employment in a wide variety of situations. The Fast Carrier Task Forces have a very potent atomic weapon delivery capability in the event of a general nuclear war. With the Strategic Air Command it therefore shares to some degree the mission of deterring a nuclear war. This capability is not built in with an idea of usurping or competing with the mission of SAC. It is a valuable by-product of the Navy's own mission of maintaining control of the seas in war.

• Limited war capability—The aircraft complement of carriers is not oriented exclusively toward nuclear war, however. While all of our aircraft have the capability of participating in nuclear war, we have always insisted and will continue to insist that all of our aircraft be capable of participating with full effectiveness in military or naval situations short of general war—the so-called limited wars. In such actions they must be capable of delivering either small atomic or conventional weapons with the necessary precision and in the required volume.

Carriers are one of the most logical and economical means available to the United States of applying air power in limited war. They can be moved anywhere there is water and they avoid the problems of bases on foreign soil. Seven-tenths of the earth's surface is water and no target on land is beyond reach of seaborne forces.

• Defensive capability—Defensive use of naval aircraft to protect sea communications will involve participation in the escort and routing of convoys, barrier air patrols, barrier killer submarine patrols, hunter-killer carrier-destroyer teams, long-range underwater listening devices, direction-finding nets and mining of enemy bases and enemy exits to the sea.

When convoys sail from or arrive at ports they will be covered by escort vessels, blimps and helicopters. These helicopters will be carried on board escort carriers and will accompany the convoy throughout its passage. The sealanes through which the convoy passes will be swept by long-range patrol planes which within their combat radius capabilities will furnish air cover to augment helicopters and destroyers.

• Technical capability—Typical of the Navy's progress in technical improvement is the development of jet seaplanes. In the years immediately following WW II, naval interest in seaplanes declined. Conventional seaplanes were not able to compete with land planes in flight performance. This resulted from aerodynamic handicaps associated with the need to place engines and propellers high above the water. In 1947, the Navy commenced preliminary design studies of a seaplane using jet power. As a result of this study the Chief of Naval Operations issued an operational requirement for a high performance seaplane that would live on the water, being removed therefrom only for major maintenance and hull repairs, and be supported primarily by tenders. The P6M SeaMaster is the result of this requirement.

Its attractiveness to the Navy is in the diversity of naval employments of which it is capable and in the security of the deployed units from surprise atomic attack. Operating from tenders in the forward areas, in protected harbors and waterways near the scene of action, this plane is suitable for employment in all varieties of warfare from mine-laying in peripheral and conventional war to nuclear attack in all-out war. It also appears to be suitable for developmental work in adapting nuclear power to aircraft propulsion. Such an aircraft will be attractive in antisubmarine warfare and overwater reconnaissance.

This is the Navy's airpower—the heart of the Fleet. The overall capabilities of this versatile and mobile power is a vital ingredient of our national military strength, now and in the foreseeable future.

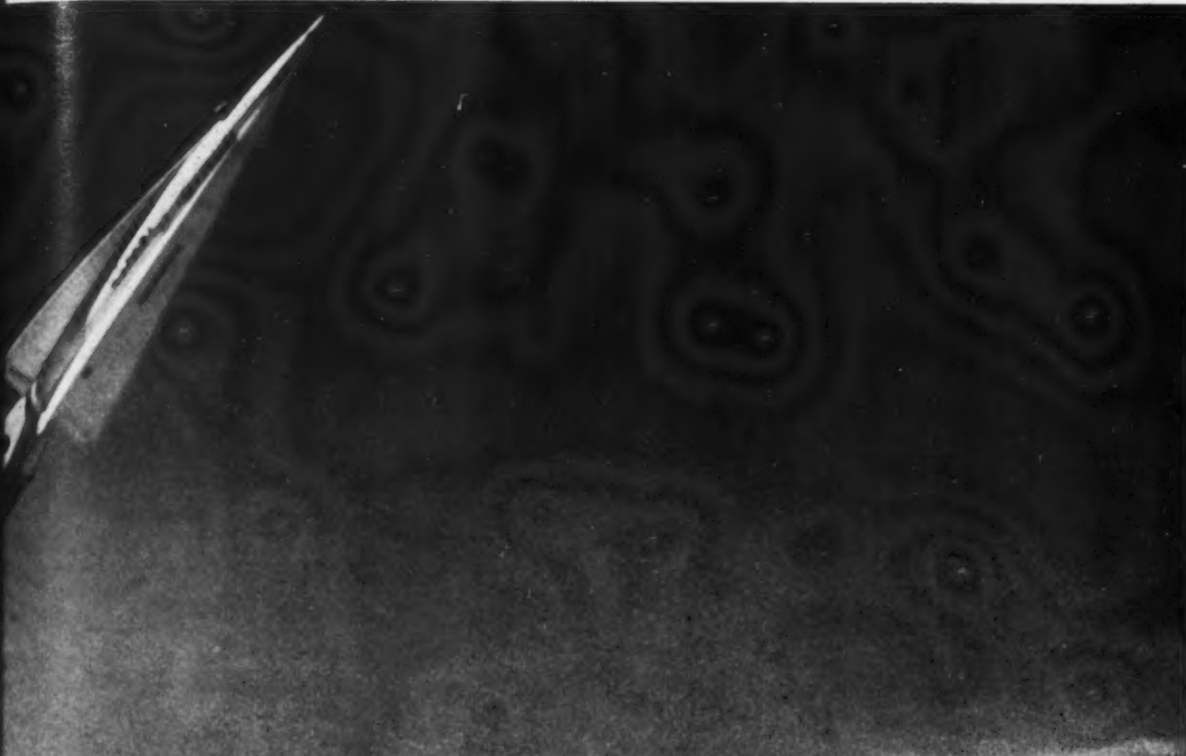
Modern defense in action:*

Nike Hercules missile blocks sneak attacks

On guard at the outskirts of all major American cities and industrial centers, missiles of the Douglas Nike family are designed to intercept and destroy attacking aircraft—despite the most vigorous evasive action.

Nike-Ajax was the Army's first supersonic anti-aircraft missile. The basic design readily lends itself to new developments as anti-aircraft requirements change.

Nike-Ajax batteries are now being integrated with a newer Nike – the Hercules, developed through the joint cooperation of Douglas, Western Electric and Bell Telephone Laboratories. It has twice the range and speed of its predecessor. Armed with an atomic warhead, Nike



Practice firing at White Sands Proving Ground of the Army's new medium-range Nike-Hercules interceptor missile.

Hercules can blast entire attacking fleets of aircraft with a single shot—without damage to surrounding terrain.

Designed primarily for the inner line of our overall air defenses, Douglas Nike missiles are radar guided from ground installations. Within seconds of the first alert, they can be off towards their target—with deadly aim.

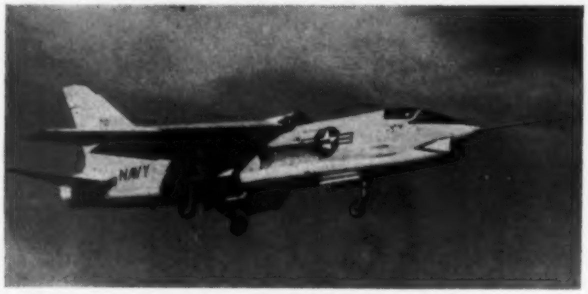
Depend on

DOUGLAS

The Armed Services' partner in defense

Inventory of U.S. Naval Airpower

. . . Fighter Aircraft

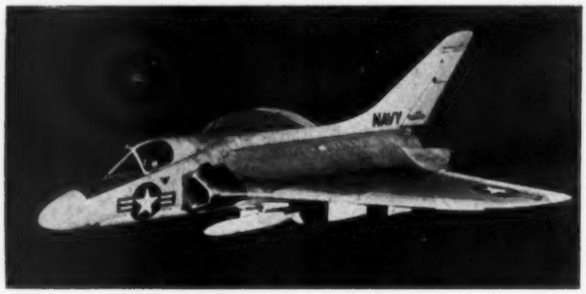


Chance Vought F8U-1 Crusader

TYPE: single-place, single-jet, carrier-based day fighter. DIMENSIONS: L—54' 3"; Span—35' 8"; H—15' 9". WEIGHTS: No data available. POWERPLANT: Pratt & Whitney J57-P-4; rating—over 10,000 lbs. st. plus a/b. PERFORMANCE: max. speed—over 1,000 mph. All other data classified. ARMAMENT: 4 x 20 mm cannons, 32 x 2.75-in. rockets and 2 Sidewinder missiles. REMARKS: Other versions of the Crusader are: F8U-1P—photo reconnaissance version; F8U-2—advanced version of the -1 currently under production. MFR: Chance Vought Aircraft, Inc., Dallas, Tex.

McDonnell F3H-2 Demon

TYPE: single-place, single-jet, carrier-based fighter. DIMENSIONS: L—58' 11"; Span—35' 4"; H—14' 7". WEIGHTS: gross—approx. 30,000 lbs. POWERPLANT: Allison J71; rating—approx. 9,000 lbs. st. plus a/b. PERFORMANCE: max. speed—over 700 mph; range—over 1,000 mi. ARMAMENT: 4 x 20 mm cannons plus provision for Sidewinder missiles. Other versions are armed with Sparrow missiles. REMARKS: Other versions of operational Demons are: F3H-2N—all-weather fighter; F3H-2M—missile carrier; F3H-2P—photographic reconnaissance version. MFR: McDonnell Aircraft Corp., St. Louis, Mo.

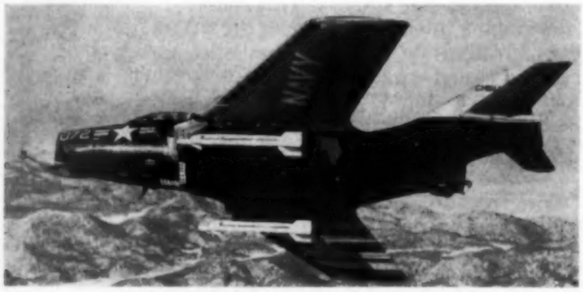


Douglas F4D-1 Skyray

TYPE: single-place, single-jet, carrier-based interceptor. DIMENSIONS: L—44' 4"; Span—33' 6"; H—13'. WEIGHTS: gross—approx. 25,000 lbs. POWERPLANT: Pratt & Whitney J57-P-2; rating—approx. 10,000 lbs. st. plus a/b. PERFORMANCE: max. speed—over 700 mph. All other data classified. ARMAMENT: unspecified number of 20 mm cannons and rocket packages. Provision is made for underwing fuel tanks or bombs. MFR: Douglas Aircraft Co., Inc., El Segundo, Calif.

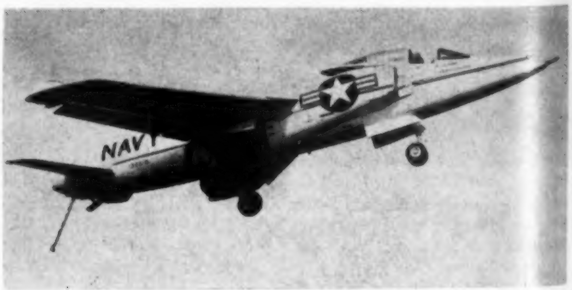
McDonnell F2H Banshee

TYPE: single-place, twin-jet, carrier-based fighter. DIMENSIONS: L—40' 1"; Span—44' 11"; H—14' 5½". WEIGHTS: gross—14,000 lbs. POWERPLANTS: (2) Westinghouse J34-WE-34s; rating—3,250 lbs. st. PERFORMANCE: max. speed—630 mph; initial rate of climb—9,000 fpm; combat radius—600 mi. ARMAMENT: unspecified number of cannons. REMARKS: Versions of the Banshee produced but no longer in production are: F2H-1; F2H-2N—night fighter; F2H-2P—photographic reconnaissance; F2H-3—long-range all-weather fighter; F2H-4—last production model. MFR: McDonnell Aircraft Corp., St. Louis, Mo.



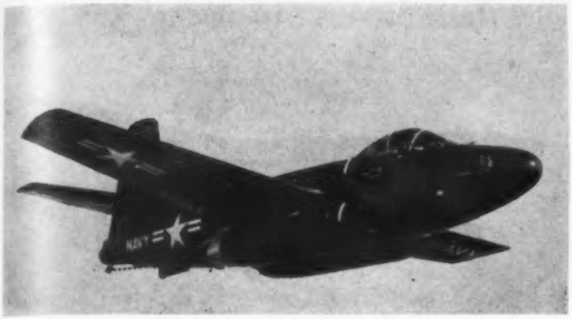
Grumman F9F-8 Cougar

TYPE: single-place, single-jet, carrier-based fighter. DIMENSIONS: L—41' 7"; Span—34' 6"; H—12' 3". WEIGHTS: gross—approx. 20,000 lbs. POWERPLANT: Pratt & Whitney J48; rating—approx. 7,000 lbs. st. PERFORMANCE: max. speed—over 650 mph; max. range—over 1,000 mi. ARMAMENT: 4 x 20 mm cannons. REMARKS: The Cougar succeeded the straight-wing Panther. Other versions are: F9F-6; F9F-6P; F9F-7 and F9F-8T. MFR: Grumman Aircraft Engineering Corp., Bethpage, L.I., N.Y.



Grumman F11F-1 Tiger

TYPE: single-place, single-jet, carrier-based fighter. DIMENSIONS: L—40' 10"; Span—31' 8"; H—12' 9". WEIGHTS: gross—13,850 lbs. POWERPLANT: Wright J65-W-6; max. rating—7,800 lbs. st. with afterburner. PERFORMANCE: max. speed—over 650 mph. No other data available. ARMAMENT: 2 x 20 mm cannons. REMARKS: Other versions of the Tiger are F11F-1F Super Tiger and F11F-1FT. MFR: Grumman Aircraft Engineering Corp., Bethpage, L.I., N.Y.



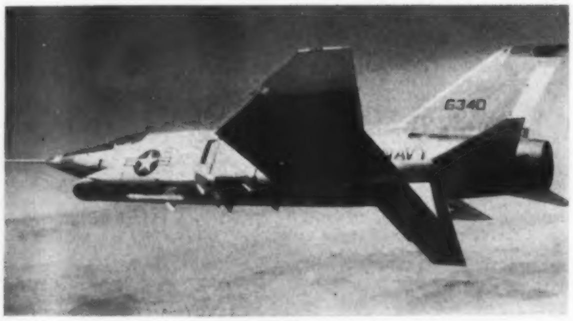
Douglas F3D Skynight

TYPE: two-place, twin-jet, carrier-based all-weather fighter. DIMENSIONS: L—45' 6¼"; Span—50'; H—16' 6". WEIGHTS: empty—18,160 lbs.; gross—27,000 lbs. POWERPLANTS: (2) Westinghouse J34-WE-36s; rating—3,400 lbs. st. PERFORMANCE: max. speed—560 mph; initial rate of climb—2,500 fpm; combat radius—600 mi. ARMAMENT: 4 x 20 mm cannons with provisions for rockets, bombs and other external stores under the wings. REMARKS: Production Skynights were designated F3D-1 and -2. Neither aircraft in production. Such models remaining in service have been relegated to secondary roles and are no longer considered first line aircraft. MFR: Douglas Aircraft Co., Inc., El Segundo, Calif.

North American FJ-4B Fury

TYPE: single-place, single-engine, carrier-based fighter/bomber. DIMENSIONS: L—37' 7"; Span—39' 1"; H—13' 11". WEIGHTS: gross—19,900 lbs. POWERPLANT: Wright J65-W-16A; rating—7,700 lbs. st. PERFORMANCE: max. speed—687 mph; initial rate of climb—7,500 fpm; range—over 1,000 mi. ARMAMENT: 4 x 20 mm cannons plus Sidewinder missiles. REMARKS: This aircraft was developed from the FJ-4 which in turn succeeded the FJ-3. MFR: North American Aviation, Inc., Columbus, O.

. . . Fighters—Under Evaluation



Chance Vought F8U-3 Crusader III

TYPE: single-place, single-jet, carrier-based fighter. DIMENSIONS: L—58' 8¾"; Span—39' 11"; H—16' 4½". WEIGHTS: No data available. POWERPLANT: Pratt & Whitney J75; rating—approx. 26,000 lbs. st. with a/b. PERFORMANCE: max. speed—over Mach 2. No other data available. ARMAMENT: Sparrow missiles, conventional and nuclear weapons. REMARKS: The Crusader III is a redesigned and more advanced version of earlier Crusader models. Aircraft is scheduled to undergo preliminary evaluation by the Navy. MFR: Chance Vought Aircraft, Inc., Dallas, Tex.

McDonnell F4H-1

TYPE: two-place, twin-jet, all-weather interceptor. DIMENSIONS: L—56'; Span—38' 5". WEIGHTS: no data available. POWERPLANTS: (2) General Electric J79s; rating—approx. 15,000 lbs. st. PERFORMANCE: max. speed—over Mach 2. No other data available. ARMAMENT: Sparrow missiles. REMARKS: The F4H-1 is scheduled to undergo preliminary evaluation by the Navy. MFR: McDonnell Aircraft Corp., St. Louis, Mo.

. . . Attack Aircraft

Douglas A4D Skyhawk

TYPE: single-place, single-jet, carrier-based light attack bomber. DIMENSIONS: L—39' 1"; Span—27' 6"; H—15' 2". WEIGHTS: empty—8,300 lbs.; gross—15,000 lbs. POWERPLANT: Wright J65-W-4; rating—approx. 7,200 lbs. st. PERFORMANCE: max. speed—over 700 mph; range—over 1,000 mi. ARMAMENT: 2 x 20 mm cannons with provision for external stores such as bombs, torpedoes, missiles and nuclear weapons. REMARKS: Versions of the Skyhawk in service with the Navy are the A4D-1 and A4D-2. MFR: Douglas Aircraft Co., Inc., El Segundo, Calif.

Douglas AD-6 Skyraider

TYPE: single-place, single-engine, carrier-based attack bomber. DIMENSIONS: L—39'; Span—50'; H—15' 8". WEIGHTS: empty—12,094 lbs.; gross—18,000 lbs. POWERPLANT: Wright R3350-26WB; rating—2,700 hp. PERFORMANCE: max. speed—365 mph; initial rate of climb—2,850 fpm; range—approx. 1,500 mi. ARMAMENT: 4 x 20 mm cannons with provision for rockets, bombs and torpedoes under the wings and fuselage. REMARKS: The AD-7 was the last of its type to be produced. Variously designated from the AD-1 thru AD-7 the Skyraider models were produced in varying forms for a wide variety of roles. MFR: Douglas Aircraft Co., Inc., El Segundo, Calif.

. . . Attack Aircraft (Cont'd.)

Douglas A3D Skywarrior

TYPE: three-place, twin-jet, carrier-based attack bomber. DIMENSIONS: L—73' 6"; Span—72' 6"; H—22' 9". WEIGHTS: empty—approx. 38,000 lbs.; gross—84,000 lbs. POWERPLANTS: (2) Pratt & Whitney J57-P-10.; rating—approx. 10,000 lbs. st. PERFORMANCE: max. speed—over 650 mph; range—approx. 2,000 mi. ARMAMENT: 2 x 20 mm cannons. Bomb bay adaptable to carry a variety of offensive weapons. REMARKS: Other versions of the Skywarrior are: A3D-2; A3D-2P—photographic reconnaissance version; A3D-2Q—radar countermeasure version; A3D-2T—bombardier trainer. MFR: Douglas Aircraft Co., Inc., El Segundo, Calif.

. . . Attack—Evaluation

North American A3J-1 Vigilante

TYPE: two-place, twin-jet, carrier-based attack aircraft. DIMENSIONS: L—70'; S—50'; H—20'. WEIGHTS: gross—approx. 49,500 lbs. POWERPLANTS: (2) General Electric J79-GE-2s; rating—15,000 lbs. st. with a/b. PERFORMANCE: max. speed—approx. Mach 2.2. No other data available. ARMAMENT: Capable of delivering both conventional and nuclear weapons at either high or low altitudes. REMARKS: The A3J-1 made its first flight last May and is undergoing initial tests for the Navy. MFR: North American Aviation, Inc., Columbus 16, O.

. . . Training Aircraft

Grumman TF-1 Trader

TYPE: twin-engine, general utility trainer/transport. DIMENSIONS: L—42'; Span—69' 8"; H—16' 3½". WEIGHTS: empty—17,000 lbs. gross—24,500 lbs. POWERPLANTS: (2) Wright R1820-82s; rating—1,520 hp. PERFORMANCE: max. speed—290 mph; cruise speed—202 mph; initial rate of climb—2,500 fpm; range—1,150 mi. REMARKS: The TF-1 is a version of the S2F Tracker. Provision is made to carry nine passengers in rearward facing seats. MFR: Grumman Aircraft Engineering Corp., Bethpage, LI., N.Y.

Beech T34B Mentor

TYPE: two-place, single-engine, primary trainer. DIMENSIONS: L—25' 11"; Span—32' 10"; H—9' 7". WEIGHTS: empty—2,246 lbs.; gross—2,975 lbs. POWERPLANT: Continental 0-470-13; rating—225 hp. PERFORMANCE: max. speed—188 mph; cruise speed—170 mph; initial rate of climb—1,160 fpm; range—728 mi. REMARKS: The Mentor is basically a military version of the civil Bonanza. Although the fuselage has been completely redesigned, many Bonanza parts are used in the airplane. MFR: Beech Aircraft Corp., Wichita, Kan.

North American T-28

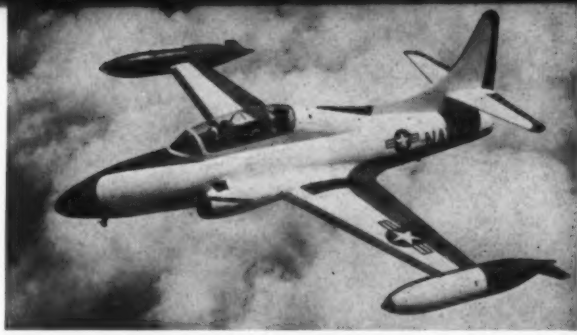
TYPE: two-place, single-engine, basic trainer. DIMENSIONS: L—32' 11"; Span—40' 7½"; H—12' 8". WEIGHTS: empty—5,780 lbs.; gross—7,339 lbs. POWERPLANT: Wright R1820-9HD; rating—1,425 hp. PERFORMANCE: max. speed—346 mph; cruise speed—246 mph; initial rate of climb—3,830 fpm; range—approx. 1,000 mi. REMARKS: Two versions of this aircraft were produced for the Navy—T-28B and T-28C. Photo and specifications are for the T-28B. The T-28C was fitted with an arrester gear. MFR: North American Aviation, Inc., Columbus, O.

Lockheed TV-2

TYPE: two-place, single-engine, advanced jet trainer. DIMENSIONS: L—37' 8"; Span—38' 10½"; H—11' 8". WEIGHTS: empty—8,400 lbs.; gross—11,965 lbs. POWERPLANT: Allison J33-A-35; rating—5,400 lbs. st. PERFORMANCE: max. speed—600 mph; initial rate of climb—5,525 fpm; range—1,345 mi. REMARKS: The TV-2 is the Navy version of the USAF T-33A which in turn is basically a two-place version of the F-80 fighter. No longer in production. MFR: Lockheed Aircraft Corp., Burbank, Calif.

Grumman F9F-8T

TYPE: two-seat, single-jet, fighter trainer. DIMENSIONS: L—48' 6"; Span—34' 6"; H—12' 1". WEIGHTS: gross—20,600 lbs. POWERPLANT: Pratt & Whitney J48-P-8A; rating—7,200 lbs. st. PERFORMANCE: max. speed—over 650 mph. ARMAMENT: 2 x 20 mm cannons. REMARKS: The -8T is a two-place version of the F9F-8 Cougar. The trainer version can also be used as an operational fighter. MFR: Grumman Aircraft Engineering Corp., Bethpage, LI., N.Y.



Lockheed T2V-1 SeaStar

TYPE: two-place, single-engine, advanced jet trainer. DIMENSIONS: L—38'; Span—42'; H—13'. WEIGHTS: gross—16,400 lbs. POWERPLANT: Allison J33-A-22; rating—6,100 lbs. st. PERFORMANCE: max. speed—over 600 mph; range—approx. 900 mi. REMARKS: The SeaSTAR is equipped with an arrester gear for operation from carriers. MFR: Lockheed Aircraft Corp., Burbank, Calif.

. . . Training Aircraft—Under Evaluation

North American T2J-1

TYPE: two-place, single-engine, jet trainer. DIMENSIONS: L—38' 8¼"; Span—36'; H—14' 9½". WEIGHTS: empty—6,484 lbs.; gross—9,507 lbs. POWERPLANT: Westinghouse J34-WE-36; rating—3,400 lbs. st. PERFORMANCE: max. cruise speed—495 mph; economical cruise speed—465 mph; max. range with tip tanks—840 n.mi. REMARKS: The T2J-1 has been ordered in limited quantities for evaluation. MFR: North American Aviation, Inc., Columbus 16, O.

Temco TT-1 Pinto

TYPE: two-place, single-engine, primary jet trainer. DIMENSIONS: L—30'; Span—29' 10"; H—10' 10". WEIGHTS: empty—3,139 lbs.; gross—4,400 lbs. POWERPLANT: Continental J69-T-9; rating—920 lbs. st. PERFORMANCE: max. speed—328 mph; cruise speed—270 mph; initial rate of climb—1,900 fpm; max. range—276 mi. REMARKS: The TT-1 has been ordered in limited quantities for evaluation. MFR: Temco Aircraft Corp., Dallas 22, Tex.

. . . Miscellaneous Aircraft

Beech SNB-5

TYPE: 5-7 place, twin-engine, general utility transport/trainer. DIMENSIONS: L—33' 11½"; Span—47' 7"; H—9' 2½". WEIGHTS: empty—5,770 lbs.; gross—8,750 lbs. POWERPLANTS: (2) Pratt & Whitney R985-B5s; rating—450 hp. PERFORMANCE: max. speed—233 mph; cruise speed—211 mph; initial rate of climb—1,190 fpm; normal range—1,125 mi. REMARKS: The design of this aircraft dates back almost 21 years and many SNBs and a few JRBs are still being used by the Navy in various roles. Although no longer in production for the military, modified civil models are still in production. MFR: Beech Aircraft Corp., Wichita, Kan.

Grumman UF-1

TYPE: twin-engine, general utility amphibian. DIMENSIONS: L—62' 4"; Span—[illegible]6' 6"; H—26' 11". WEIGHTS: empty—25,600 lbs.; gross—35,600 lbs. POWERPLANTS: (2) Wright R1820-76As; rating—1,425 hp. PERFORMANCE: max. speed—265 mph; cruise speed—225 mph; initial rate of climb—1,320 fpm; max. range with drop tanks—2,600 n.mi. REMARKS: All UF-1s are being modified as they come in for repair and inspection. Modification consists of adding extensions to the wings, larger tail surfaces and streamlined antenna housings. MFR: Grumman Aircraft Engineering Corp., Bethpage, L.I., N.Y.

. . . ASW and AEW Patrol Aircraft

Lockheed WV-2

TYPE: four-engine, reconnaissance and early-warning radar intelligence aircraft. DIMENSIONS: L—116′ 2″; Span—123′ 5″; H—27′. WEIGHTS: gross—140,000 lbs. POWERPLANTS: (4) Wright R3350s; rating—3,250 hp. PERFORMANCE: cruise speed—approx. 180 kts. REMARKS: A newer version which carries a large radar scanner in a streamlined saucer-shaped housing has been designated WV-2E. A weather reconnaissance version with special electronic equipment is known as WV-3. MFR: Lockheed Aircraft Corp., Burbank, Calif.

Martin P5M-2 Marlin

TYPE: eleven-place, twin-engine, ASW flying boat. DIMENSIONS: L—101′; Span—118′ 2½″; H—38′ 5″. WEIGHTS: empty—46,933 lbs.; gross—73,055 lbs. POWERPLANTS: (2) Wright R3350-32Ws; rating—3,450 hp. PERFORMANCE: max. speed—245 mph; range—approx. 3,000 mi.; initial rate of climb—1,200 fpm. ARMAMENT: 2 x 20 mm cannons with provision for offensive weapons in engine nacelle bomb-bays. REMARKS: Succeeds the P5M-1. The -2 has a new T tail. MFR: The Martin Co., Baltimore 3, Md.

Grumman S2F-1 Tracker

TYPE: four-place, twin-engine, carrier-based antisubmarine search and attack aircraft. DIMENSIONS: L—42′ 3″; Span—69′ 8″; H—16′ 3″. WEIGHTS: gross—over 21,000 lbs. POWERPLANTS: (2) Wright R1820-82s; rating—1,525 hp. PERFORMANCE: max. speed—over 250 mph. No other data available. ARMAMENT: Sonobuoys, missiles and depth charges. REMARKS: A later model designated S2F-2 has an enlarged torpedo bay on the port side. Tail area has been increased. MFR: Grumman Aircraft Engineering Corp., Bethpage, L.I., N.Y.

Lockheed PV3-1 Electra

TYPE: four-engine, ASW turboprop patrol aircraft. DIMENSIONS: L—104′ 6″; Span—99′; H—33′. WEIGHTS: No details available. POWERPLANTS: (4) Allison T56-A-10Ws; rating—4,500 shp. PERFORMANCE: max. speed—over 460 mph. No other details available. REMARKS: The PV3 design is basically a military version of the civil Electra. Lockheed has been awarded for pre-production work on the PV3. MFR: Lockheed Aircraft Corp., Burbank, Calif.

Lockheed P2V-7 Neptune

TYPE: seven-place, four-engine, long-range patrol bomber. DIMENSIONS: L—91′ 5″; Span—103′; H—28′ 1″. WEIGHTS: empty—47,450 lbs.; gross—75,500 lbs. POWERPLANTS: (2) Wright R3350-32Ws and (2) Westinghouse J34 turbojets; rating—3,500 hp. (R3350) and 3,400 lbs. st. (J34). PERFORMANCE: max. speed—over 350 mph; range—over 4,000 mi. ARMAMENT: 6 x 20 mm cannons with provision for rockets in underwing racks. Internal bomb bay. REMARKS: The latest Neptune in service is the P2V-7. All models starting with P2V-1 through P2V-7 have been used by the Navy. Many of the earlier models are being modified to P2V-7 standard. MFR: Lockheed Aircraft Corp., Burbank, Calif.

. . . AEW and Reconnaissance Aircraft—Under Evaluation

Grumman WF-2 Tracer

TYPE: twin-engine, AEW carrier-based aircraft. To date no information has been released on this aircraft other than that it is in production. Grumman Aircraft Engineering Corp., Bethpage, L.I., N.Y.

Martin P6M-1 SeaMaster

TYPE: four-place, four-jet, mine-laying and reconnaissance flying boat. DIMENSIONS: L—134'; Span—100'; H—31'. WEIGHTS: gross—160,000 lbs.; payload—30,000 lbs. POWERPLANTS: (4) Allison J71s; rating—13,000 lbs. st. with a/b. PERFORMANCE: max. speed—over 600 mph; range—over 1,500 mi. REMARKS: A total of 24 SeaMasters have been ordered by the Navy. The first six have been completed and are being evaluated. These carry the designation P6M-1. Eighteen production models have been ordered and will carry the designation P6M-2. MFR: The Martin Co., Baltimore 3, Md.

. . . Transport Aircraft

Douglas R5D-5

TYPE: four-engine, personnel and cargo transport. DIMENSIONS: L—93' 11"; Span—117' 6"; H—27' 6¼". WEIGHTS: empty—40,806 lbs.; gross—73,000 lbs. POWERPLANTS: (4) Pratt & Whitney R2800s; rating—1,540 hp. PERFORMANCE: max. speed—280 mph; cruise speed—246 mph; range—1,680 mi. REMARKS: This aircraft is the Navy version of the civil DC-4. No longer in production. MFR: Douglas Aircraft Co., Inc., Santa Monica, Calif.

Douglas R6D-1

TYPE: four-engine, personnel and cargo transport. DIMENSIONS: L—105' 7"; Span—117' 6"; H—28' 8". WEIGHTS: empty—54,148 lbs.; gross—106,000 lbs. POWERPLANTS: (4) Pratt & Whitney R2800-CB17s; rating—2,500 hp. PERFORMANCE: max. speed—370 mph; cruise speed—318 mph; initial rate of climb—1,020 fpm; normal range—3,860 mi. REMARKS: The R6D is the Navy version of the civil DC-6A Liftmaster and the USAF C-118A. No longer in production. MFR: Douglas Aircraft Co., Inc., Santa Monica, Calif.

Lockheed R7V-1

TYPE: four-engine, personnel or cargo transport. DIMENSIONS: L—116'; Span—123'; H—24' 9". WEIGHTS: gross—133,000 lbs. POWERPLANTS: (4) Wright R3350-34Ws; rating—3,250 hp. PERFORMANCE: max. speed—352 mph; cruise speed—331 mph; initial rate of climb—1,140 fpm; max. range—approx. 4,500 mi. REMARKS: This aircraft is the Navy version of the civil 1049B Super Constellation. No longer in production. MFR: Lockheed Aircraft Corp., Burbank, Calif.

Convair R4Y-1

TYPE: twin-engine, personnel or cargo transport. DIMENSIONS: L—79' 2"; Span—105' 4"; H—28' 2". WEIGHTS: empty—29,000 lbs.; gross—47,000 lbs. POWERPLANTS: (2) Pratt & Whitney R2800-52Ws; rating—2,500 hp. PERFORMANCE: max. speed—294 mph; cruise speed—289 mph. REMARKS: This aircraft is the Navy version of the civil Model 340. Other versions of this model are: R4Y-1Z—V.I.P. version and R4Y-2—Navy version of the civil Model 440 Metropolitan.

Douglas R4D-8

TYPE: twin-engine, personnel and cargo transport. DIMENSIONS: L—67' 8½"; Span—90'; H—18' 3". WEIGHTS: empty—19,537 lbs.; gross—31,000 lbs. POWERPLANTS: (2) Wright R1820-80s; rating—1,535 hp. PERFORMANCE: max. speed—270 mph; cruise speed—251 mph; initial rate of climb—1,300 fpm; normal range—1,425 mi. REMARKS: The R4D-8 is the equivalent of the civil Super DC-3. All Navy -8s are conversions of earlier R4Ds. MFR: Douglas Aircraft Co., Inc., Santa Monica, Calif.

Bell HUL/HTL

TYPE: single-rotor, single-engine, training and general utility helicopter. DIMENSIONS: overall length—43′ 4″; rotor dia.—37′ 2″; H—9′ 4″. WEIGHTS: empty—1,618 lbs.; gross—2,800 lbs. POWERPLANT: Lycoming VO-435; rating—240 hp. PERFORMANCE: max. speed—105 mph; cruise speed—95 mph; range—214 mi. REMARKS: HUL-1 is used for general utility and icebreaker patrol. HTL-7 is a basic training model. Both can be fitted with pontoons. MFR: Bell Helicopter Corp., Fort Worth, Tex.

Kaman HUK-1

TYPE: five-place, single-engine, twin-rotor utility helicopter. DIMENSIONS: Rotor dia.—47′; Length—25′; Height—11′ 10″. WEIGHTS: empty—4,040 lbs.; gross—6,800 lbs. POWERPLANT: Pratt & Whitney R-1340 rated 600 hp. @ 2,700 rpm. PERFORMANCE: max. speed—110 mph; cruise—93 mph; rate of climb—1,580 fpm; range—220 mi. REMARKS: Utility version of HOK-1 used by Marine Corps. MFR: Kaman Aircraft Corp., Bloomfield, Conn.

Sikorsky HR2S-1W

TYPE: Twin-engine, single-rotor, radar early warning helicopter. DIMENSIONS: Rotor dia.—72′; length—60′; height—17′ 1″. WEIGHTS: empty—21,240 lbs.; gross—31,000 lbs. POWERPLANT: (2) Pratt & Whitney R-2800 derated to 1,900 hp. PERFORMANCE: Max. speed—140 mph; cruise—115 mph; rate of climb—990 fpm; range—not available. REMARKS: The HR2S is one of the first helicopters to be equipped with retractable landing gear. MFR: Sikorsky Aircraft Div., United Aircraft Corp., Bridgeport, Conn.

Bell HSL-1

TYPE: twin-rotor, twin-engine, ASW helicopter. DIMENSIONS: Fuselage length—39′ 2½″; rotor dia.—51′ 6″; H—14′ 6″. WEIGHTS: gross—26,500 lbs. POWERPLANT: Pratt & Whitney R2800-50s; rating—1,900 hp. PERFORMANCE: max. speed—138 mph; cruise speed—100 mph; range—350 mi. REMARKS: Helicopter is equipped with sonar for submarine detection and carries self-homing missiles. No longer in production. MFR: Bell Helicopter Corp., Fort Worth, Tex.

Sikorsky HSS

TYPE: Two-crew, 12-passenger, single-engine, single-rotor, general purpose helicopter. DIMENSIONS: Rotor dia.—56′; length—46′ 9″; height—15′ 10″. WEIGHTS: Empty—7,630 lbs.; gross—13,000 lbs. POWERPLANT: Wright R-1820 rated at 1,525 hp. PERFORMANCE: max. speed—123 mph; cruise—98 mph; rate of climb—1,075 fpm; range—195 mi. REMARKS: Navy version of commercial S-58. MFR: Sikorsky Aircraft Div., United Aircraft Corp., Bridgeport, Conn.

Vertol HUP-2

TYPE: twin-rotor, single-engine, general utility helicopter. DIMENSIONS: Fuselage length—32′; rotor dia.—35′; H—13′ 2″. WEIGHTS: empty—4,132 lbs.; gross—5,750 lbs. POWERPLANT: Continental R975-46; rating—550 hp. PERFORMANCE: max. speed—105 mph; cruise speed—80 mph; initial rate of climb—1,000 fpm; range—approx. 340 mi. REMARKS: The HUP-2 is fitted with sonar equipment. It is also used for a plane guard, rescue and transport duties. MFR: Vertol Aircraft Corp., Morton, Pa.

Sikorsky HO4S-3

TYPE: single-rotor, single-engine, general utility helicopter. DIMENSIONS: fuselage length—42′ 2″; rotor dia.—53′; H—13′ 4″. WEIGHTS: empty—5,188 lbs.; gross—7,500 lbs. POWERPLANT: Wright R1300-3; rating—700 hp. PERFORMANCE: max. speed—112 mph; cruise speed—91 mph; initial rate of climb—1,000 fpm; range (with reserve)—360 mi. REMARKS: Helicopter is used mainly for antisubmarine duties. MFR: Sikorsky Aircraft Div. of United Aircraft Corp., Bridgeport, Conn.

Kaman HTK-1

TYPE: twin-rotor, single-engine, training helicopter. DIMENSIONS: fuselage length—20′ 6½″; rotor dia.—41′; H—12′ 6″. WEIGHTS: empty—1,750 lbs.; gross—3,100 lbs. POWERPLANT: Lycoming 0-435-4; rating—245 hp. PERFORMANCE: max. speed—81 mph; initial rate of climb—1,050 fpm; range—120 mi. REMARKS: The HTK can be adapted for ambulance and antisubmarine duties. No longer in production. MFR: Kaman Aircraft Corp., Bloomfield, Conn.

...Helicopters—Under Evaluation

Kaman HU2K-1

TYPE: single-rotor, single-engine, utility helicopter. POWERPLANT: General Electric T58; rating—1,050 shp. No other details available. REMARKS: Kaman has received a Navy contract to produce a prototype quantity of HU2K-1s. MFR: Kaman Aircraft Corp., Bloomfield, Conn.

Hiller HOE-1

TYPE: two-place, twin-ramjet helicopter. DIMENSIONS: fuselage length—23′; rotor dia.—23′; H—7′ 10″. WEIGHTS: empty—544 lbs.; gross—1,080 lbs. POWERPLANTS: (2) Hiller 8RJ2B ramjets attached to rotor blades; rating—40 lbs. st. PERFORMANCE: cruise speed—69 mph; initial rate of climb—700 fpm; range—28 mi. REMARKS: Ramjet helicopter was developed for evaluation by the Army and Navy. MFR: Hiller Helicopters, Palo Alto, Calif.

Doman YH-31

TYPE: Research and development test vehicle. DIMENSIONS: L—(blades folded) 38′; rotor dia.—48′; H—10′ 5″. WEIGHTS: empty—3,250 lbs.; gross—5,200 lbs. POWERPLANT: Lycoming S0-580-A1B; rating—400 hp. PERFORMANCE: max. speed—100 mph; cruise speed—81 mph; initial rate of climb—850 fpm; range—380 mi. REMARKS: In December last year, Doman submitted a proposal for providing data and experimental testing of tilting rotor system on a Model YH-31 to the Navy Bureau of Aeronautics. MFR: Doman Helicopters, Inc., Danbury, Conn.

"No Sweat"

Here, in a tape recorded interview, Herman "Fish" Salmon, one of America's top test pilots gives you his personal experiences test flying the new Lockheed Electra:

• **"When we take a pilot** up for his first flight, he's most always surprised to find there are no complicated systems on the Electra—it's as easy to fly as a single engine plane—no sweat!

• **"He has settled down** and is finding how easy the Electra flies—I reach up and cut the fuel on number one engine. They most always ask—'Have you feathered an engine?' Yaw is very mild even with a fuel failure. The Negative Torque System takes over. This permits less than about 650 pounds of drag as the propeller blade angle quickly goes to steep pitch, (almost the same as auto-feathering).

• **"In other airplanes** we would then have to go through nine different steps to clean up the cockpit. Electric system off, engine oil off, cooling air to nacelle off, cooling air to generator off, fuel off, bleed valves off, fire extinguisher armed, feather the propeller both manually and electrically. On the Electra—pull! —and it's all done. One lever does all the work. Then, I'll accidentally-like, reach up and cut number 2 engine. They are both out; we're flying on number 3 and 4 engines—even then there's no tendency for the pilot to work hard, no tendency to make wrong decisions. There are no complicated systems. One pull—we're safe.

• **"As far as pilot comfort** is concerned, we talk in the cockpit like we might in my living room. After 6 hours in the air, we're no more tired than after an hour in another airplane. We're not 'balls of snakes' when we get out.

• **"Actually, changing rpms** is the big factor in producing annoying noise. We have this problem licked from the start with Electra's Allison Prop-Jets. They turn at constant speed throughout the flight, which makes them unique. To keep the airplane from being a ground nuisance, we have a ground idle speed which cuts the engine noise to about one-half normal engine noise. There is no popping or backfiring at the terminal during engine starts.

• **"At take-off, the noise** dissipates slightly as forward motion is attained. You taxi out to the runway. In the final turn into position, there's some increase as you go from ground idle to full rpm and the power comes on. The passengers won't hear any big noise increase. Release the brakes, and the plane accelerates very rapidly, noise goes down because of the motion.

• **"In fact, the lack of noise** is deceiving. At first, you figure no noise…no power. But you check your air speed indicator and you see you're doing 100 knots!

• **"Our climbing speed is fairly high** —210 knots is recommended airline climb out. Since there's no particular problem around the airport, we don't have to pull it up in the air at high angles to get rid of noise.

• "Let's say there's a stack up to 20,000 feet when we file our flight plan. We might have to wait for say 45 minutes before take-off to get a 20,000-foot cruise altitude. With the Electra we don't have to wait on the ground until clearance can put us up at our desired cruise altitude. We can economically fly to an intermediate destination at a minimum altitude. Say at a four or five thousand foot slot. Then, with traffic lighter, we can climb out to a higher cruise altitude.

• **"Fuel management is no problem.** Electra has 4 engines, 4 tanks. This follows the simple flight station concept —to keep everything in the cockpit clean. The take-off and landing weights are close together. You can take-off, land at an en route stop, have passengers deplane, unload luggage and be on your way again in minutes. No refueling.

• **"We're in the same engine configuration from take-off through cruise,** approach and landing. When you want to go, push forward. When you want to slow, pull back. No mixture controls, no prop rpm levers, no carb heat controls.

• **"In testing, we've made jet penetration approaches,** clearing down 4,000 feet per minute. In fact, we've let down from 25,000 feet to the deck in 6 minutes. Beautiful part of this is there's no engine chilling, no wait for temperatures to equalize.

• **"Control response and power response on approach** is very precise. Very easy applications of power put you back onto the glide slope. There's no surge of noise to annoy passengers with power changes. No need to build up rpms...no overshooting and then settling. Naturally, a pilot can do a much more precise job of flying with less work.

"After six hours in the air in the Electra, I'm no more tired than after an hour in another airplane."

• **"In a descent,** the props act like dive brakes. We pull them back to idle, letting the plane down rapidly. That's why the dive flaps on the original design were later eliminated. We can meet all specs and get all the performance on the props alone, without a lot of complex machinery.

• **"No sweat on go-arounds.** If you overshoot the runway, Electra's constant-speed engines enable you to apply take-off power right now...no steps...no moving complex levers. All you do with the throttle is to change the fuel opening. Fuel added is immediately converted to prop power. These Allisons are unique in this respect—we don't need to develop engine rotational speed before obtaining power. This cuts power response delay to a minimum. You need power, you push forward...and get it!

Test Pilot Salmon tries a roomy Electra passenger seat. Note the individual intercom overhead.

• **"A bonus with these Allison Prop-Jets:** Immediately as you push throttles forward, the props wash air over the wing. This gives you an increase in air speed over the wing even before the airplane starts to accelerate!

• **"On touch down,** if we're in a hurry, Electra can stop in about 900 feet. We put the props into flat pitch, then reverse...slowing the plane to around 40. At this speed, reverse thrust is less effective, so you start to use your brakes. Another bonus here is that reverse props quickly dissipate wing lift so you get solid contact of the tires on the runway.

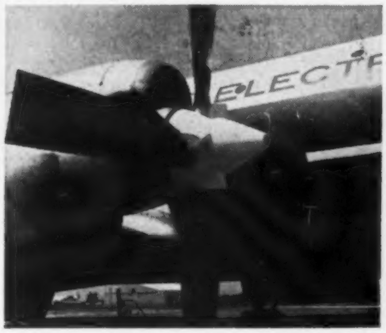
• **"It's always beautiful.** You fly this airplane, weighing 113,000 pounds, easy as a single place plane. This is a pretty broad statement, but I've flown all types. Electra has a different feel than others I've been in. The turbulence is not real sharp but not wishy-washy either. It's rather like a surfboard.

• **"Cockpit visibility** is way over what the specs call for. If you can see better, you do a better job. It's light and airy and has a roomy feeling. You can sit three across, which gives you six eyes to watch with.

• **"Instruments are the same as on other jets.** Basically they're simple. Some turbo-props have trimmers and their engines are otherwise complicated. On the Electra we don't use any differential power.

• **"Even if you lose** all hydraulic power which is very unlikely with three pumps, 2 sources of supply, 2 independent systems, you can fly it manually. It's work, but nothing dangerous about it.

• **"Electra is unique.** It combines all the modern features a pilot appreciates. He's not going to feel he will have to wait around an airport for passengers to load and baggage to get on. He will know when he's going to work and when he's coming home. If you have a maintenance problem pull out a black box, put in a new one and you're on your way. As for the propeller... some people who've yet to fly the Electra say a prop's old-fashioned. But this airplane combines the best prop characteristics with a jet engine. Once you've flown it, you know—the prop *makes* the plane."



"Once you've flown it, you know: The props *make* the plane."

• **A flier since 1931,** *when he began barnstorming at 18, "Fish" Salmon tested the P-38, B-17, the Constellation and Super Constellation, F-94, T-33; made the first flight on ramjet power; flew the first F-104A Starfighter flight.*

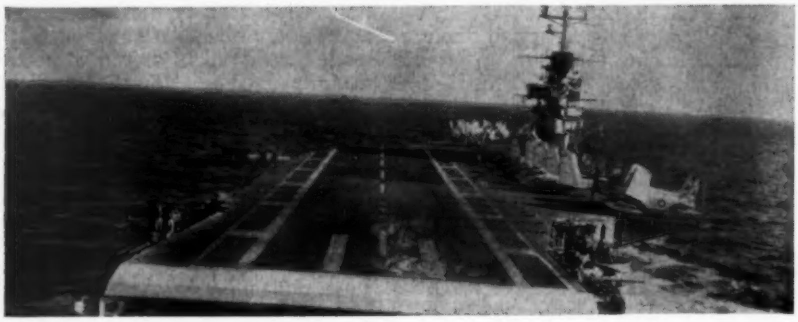
Now being delivered and soon to enter scheduled service with these leading world airlines: Aeronaves de Mexico • American Airlines • Ansett/ANA of Australia • Braniff Airways • Cathay-Pacific Airways • Eastern Air Lines • Garuda Indonesian Airways • KLM Royal Dutch Airlines • National Airlines • Northwest Orient Airlines • PSA—Pacific Southwest Airlines • Qantas Empire Airways • Tasman Empire Airways • Trans-Australia Airlines • Western Airlines.

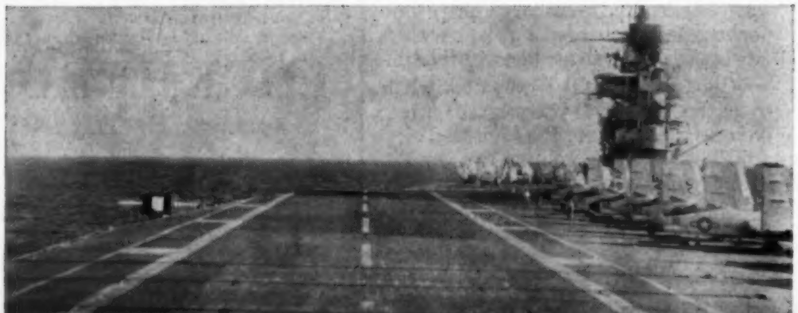
LOCKHEED

AIRCRAFT CORPORATION

California Division
Burbank, California

The Carrier—Backbone of Navy Air





Postage stamp to a pilot, but a mobile power punch for defense. And its operations are improving. Aiding are devices like the mirror landing system, at left on deck. Pilot centers orange light in mirror with aid of green side lights.

By George Hart
Technical Editor

ABOARD THE U.S.S. INTREPID OFF FLORIDA—Without question the existence of the aircraft carrier has become one of the prime reasons for the advancement of U.S. naval aviation to its present position as the third largest air force in the world. But it doesn't take one long during a first-hand look-see at carrier operations to appreciate that they are substantially more complex than just floating a land-based air force.

This point was made quite clear during a week-long stay aboard the Navy's U.S.S. Intrepid assigned to Carrier Division 2 under Rear Admiral K. Craig.

The biggest problem: Flying jets—which are fast getting faster—off the heaving deck and back on again. But, thanks to the efficiency of the crew and specialized equipment, the state of the art has been developed to a point where an aircraft can be launched every 30 seconds, and landings can be made as frequently.

On an angle deck, Essex Class carrier like the Intrepid, piston-engine aircraft normally take off under their own power and start their run just ahead of the arresting gear cables in the landing area. This gives them some 670 ft. within which to get airborne. But the jets would never get flying in 670 ft., so they make it in 220 ft.—with the help of the steam catapult.

• Steam-driven kick in the pants— Navy pilots seem to regard a ride on the "cat" as great fun, but the uninitiated onlooker quickly decides he would as soon give the pastime a wide berth. The steam catapult's power is positively frightening. For example, if pointed straight up, it could hurl the family car 5,900 ft. into the air. Recently, on a full-power test shot, one of the Intrepid's catapults fired a 70,000 lb. deadload which landed in the sea 150 yds. ahead of the ship.

Aircraft are launched with a steady 3-4G acceleration, and speeds of around 125 kts. are gained in two to three seconds.

Great care is taken in setting up each shot, and accidents are rare. But once

. . . Takeoffs and landings are tricky, but the carriers are equipped

F4D GETS A BOOST **from catapult as another is readied. Steam around starboard track is waste from last shot.**

ARRESTING GEAR OPERATOR **crouches ready to return cable picked up by TF-1. Crew (far right) will help clear hook.**

in a great while, a valve may open too slowly resulting in a "slow shot", to use catapult crew terminology. To the pilot, this is known as a "cold shot", possibly because he never attains flying speed and has to be fished out of the water by the helicopter crew flying beside the ship during operations.

Surprisingly, afterburners are not used for catapult launchings. The "cat" is far ahead where power is concerned, and the jet engine really isn't doing a thing to help matters until after the aircraft has cleared the deck.

Before a plane is launched, it's tethered to the deck through a steel fitting which holds it back while the pilot turns up to full power. At the same time, a hydraulically operated grab (which returns the steam piston assembly after each launch) is used to apply about 3,500-lbs. tension. Sheer value of holdback fitting ranges from 10,000 lbs. for a Grumman F9F to 63,000 lbs. for a Douglas A3D; however, if tension has been taken with a jolt, the fitting may break prematurely and the aircraft will head off down the deck without the aid of the catapult. Normally, the pilot can use his brakes in time to avoid going over the end of deck.

Immediately after a successful launch, the plane tends to adopt the correct flight attitude by itself if properly trimmed. About the only trouble pilots get into at this point is caused by pulling up too fast. Over-rotation can result in a stall and a subsequent dunk in the drink. But this is unusual and, after breaking to right or left (depending on which catapult has been used) to clear the area ahead of the ship, a routine climb out is made.

• **Getting down again**—If takeoffs and landings are being practiced, the first turn is made about one mile out from the ship. The pattern generally is flown at an altitude of 500 ft. and a distance of 1½ miles from the ship. Distance and position relative to the carrier is established by means of TACAN distance measuring equipment. When abeam of the ship, the turn in is started and the really ticklish part of carrier flight operations is on. It's not easy to land high-speed aircraft on a deck 500 ft. long and 70 ft. wide.

Two British developments have helped to ease the difficulties. The mirror landing system gives the pilot a glide slope to help him make a good approach. The angle deck gives him a clear field for a "bolter"—carrier talk for a missed approach—if he should fail to pick up an arresting gear cable in spite of the mirror landing system.

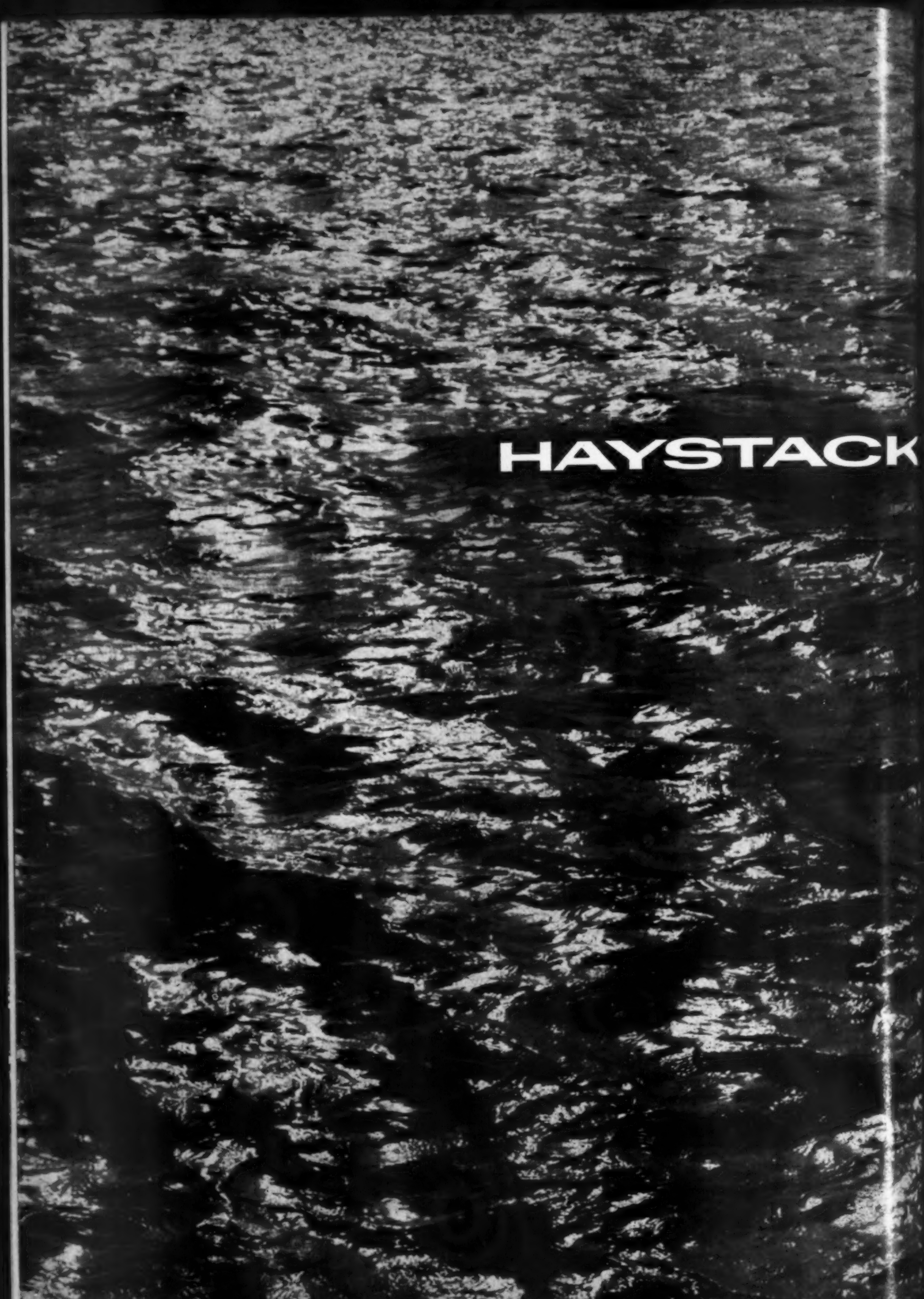
As the pilot brings his plane around into the groove, he picks up the "meatball." This is the name Navy pilots have given to an orange-colored ball of light appearing on a large, concave mirror located at the edge of the flight deck. The ball of light originates in four lamps 160 ft. aft of the mirror. The centerline of the light beam created by the system is directed so that the glide slope will bring the aircraft over the end of the deck with a hook clearance of 10 ft. For the most part, this works out to be a 4° slope, and it's set by raising or lowering the mirror.

The mirror assembly is slaved to the ship's gyro to stabilize it for a deck pitching up to 5° and rolling up to 12°. Stabilization can be accomplished manually if the slaving mechanism should fail.

The mirror landing system beam is about 50° wide and 1½° high. This means that, 3,500 ft. aft of the ship, the pilot can pick up the meatball through 4,500 ft. laterally, but only through 80 ft. vertically. Consequently, the pattern must be flown very accurately, and riding down the beam in a jet like the F4D which approaches at 135 kts. requires sensitive handling.

(Continued on p. 39)

SPACE IS AT A PREMIUM **so planes are parked only four inches apart.**


HAYSTACK

. . . Mirror and meatball get them back on deck

Currently, the mirror landing system shows the pilot where he is relative to the correct glide slope. Navy is trying to develop the system further to show the approaching pilot where he will be when he reaches the ship if he continues the approach he is making.

While aircraft are landing, the ship is cruised to maintain a wind speed of about 35 kts. across the deck. It is steered to keep the wind coming from the left about 5° off the angle deck. This keeps smoke more or less clear of the pattern and helps to counteract the slight effect created by movement of the angle deck across the approach path. In other words, since the angle deck is offset about 10° from the centerline of the carrier, the movement of the ship drags the deck along sideways.

• Watchthedameatball—There's a tendency, particularly with pilots new to carrier landing techniques, to hit the deck to left of the centerline. This is not due to the deck's 'crossing' effect. It's due to watching the meatball. Pilots seem so absorbed with the meatball that they actually tend to drag into it. However, the LSO (Landing Signal Officer) wouldn't have it any other way. In fact, if, like a bird, the LSO were to be recognized by his call, that call would be "watchthedameatball."

This makes sense. If a pilot hasn't drilled himself to watch the meatball he'll foul up landing after landing with the high-speed jet. This is especially so at night. Furthermore, a pilot who takes his eyes away to watch the deck almost invariably comes in too low. And this can lead to real trouble.

Why? On either side of the mirror there are four red wave-off lights which can be toggled by the LSO. If the pilot isn't watching the mirror, he may be slow in responding to a wave-off. A wave-off taken low and too late may lead to catching on arresting gear cable while in flight and starting a climb out under full power. The wire will pull out all the way and either it or the plane's hook will break. In either case, the plane will end up in the sea.

All the way down the glide slope, the LSO is judging the pilot's altitude and distance from the deck. In addition he is watching the plane's angle-of-attack lights. Generally, these lights are attached to the nose gear. In some aircraft, they are beamed through a fixed prism to show an amber light when the angle of attack is right, a red light when the plane is traveling too fast, and a green light when it's traveling too slow. In other aircraft, three separate lights are actuated individually by a vane or a slotted tube sticking out into the slipstream. The slipstream keeps the vane steady, and angle of attack becomes a function of the plane's rotation around the vane.

In addition, the speed of the approaching aircraft is computed by means of Doppler radar. A computer corrects the Doppler reading to allow for ship's speed and wind speed, and the plane's true airspeed is read on indicators in the control tower and at the LSO's platform.

• 105 knots to dead stop—The mirror is set so that the aircraft's hook should catch the third of five cables spaced 20 ft. apart starting 100 ft. from the aft end of the deck. The arresting gear tension is set for each landing so that the plane involved will stop in an average of about 175 ft. When an aircraft is brought from a relative speed of 105 kts. to a stop in a couple of seconds, it means that quite a strain is put on the pilot. They're subjected to a deceleration amounting to about 10 Gs vertically and 3 Gs horizontally.

(*Continued on page* 41)

HELICOPTER CREW can get pilot out and back on deck in three minutes.

. . . Carrier operations

As soon as the aircraft hits the deck, the pilot applies full power so that, if the plane's hook has missed the cables, his bolter will be over the edge and up—not down. No brakes are used but, in spite of the application of power, the cable will hold a "trapped" aircraft. Made of high grade plow steel preformed wire rope, the tough, arresting gear cables are inspected carefully before and after a session of landings. Actual failure in operation is rare.

Life of the 1⅜-in. diameter cross deck pendant, the section of the assembly hooked by the aircraft, varies from one to 200 landings, depending upon how good or bad the landings have been. The purchase cable, which runs from one end of the cross deck pendant through the arresting gear engine room and back to the other end, is good for about 2,500 landings.

However, wear on equipment during landings is pretty rough. This is particularly so if the landing is made off center, when the beating taken by the cable and hook is worst. The twist given to the unevenly loaded cable is apt to peel off the nose wheel tire.

• Aircraft maintenance—Surprisingly, aircraft maintenance practices follow the lines established for land-based operations. The same sort of handling equipment is used and spare parts are stocked for all commonly experienced failures. In fact, parts are available for all aircraft the ship is likely to carry.

Maintenance problems are not too much the result of takeoffs and landings. For the most part, these operations now require only a closer inspection than is required in land-based operations. It used to be that struts were bent on landing or damaged by the fast extension which occurs when the plane leaves the deck after a catapult shot. Now, cutting of tires due to hitting arresting cables on landing is the most common source of trouble.

Damage to aircraft during handling accounts for quite a few dents in spite of the care exercised by the handling crews. Space is limited and, to make the most of what is available, planes are parked within four inches of each other on the hangar deck. Here, they generally are pushed around by deck crews rather than by tractors. A blast on a whistle is the signal for the man in the cockpit to put on his brakes. Any time a plane director blows his whistle, all within earshot put on their brakes. This way, there's less damage due to confusion as to who blew. However, in spite of antiskid material, a mixture of oil and sea water on the deck is incredibly slippery and accidents do happen.

Engines started in the hangar, a WV-2 rolls out to fly another patrol. At Argentia, if its not snowing, it's raining. And if it's not raining, there's fog; but . . .

Foul Weather or Fair, the Barrier Patr

By George Hart
Technical Editor

ARGENTIA, NEWFOUNDLAND—Stretching from Newfoundland to an undisclosed point in the Atlantic, somewhere in the vicinity of the Azores, there's a barrier. It might well be called Navy's Great Barrier Reef because, made up of Navy ships and planes casting a radar curtain, it's designed to trap intruding enemy aircraft, and cause them to be destroyed before they ever get near the United States.

The Atlantic Barrier, its official title, is the Eastern arm of the North American early warning system, and functions as an extension of the DEW line.

In the more than two years for which the Barrier has existed, it has never gone unmanned. This speaks well for the men on the ships. Going no place in particular in all kinds of weather at sea can get pretty boring. Maintaining a complicated array of electronic equipment with the limited facilities available on a relatively small ship is no picnic.

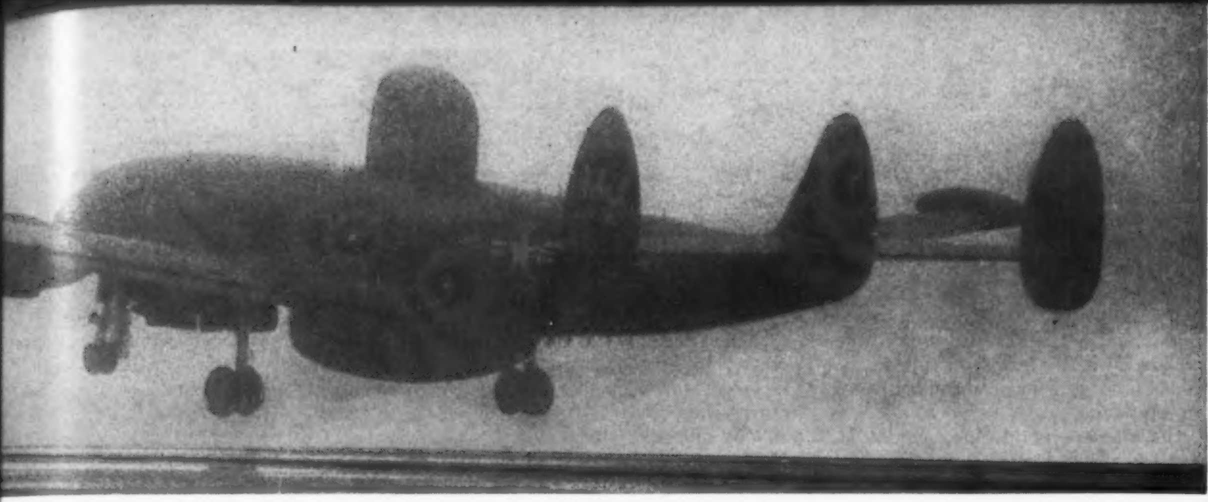
But the fact that, while the Barrier has been in existence, there has always been an **airborne** radar net is downright astonishing to anyone who has visited NAS Argentia. This is the base from which Navy's Lockheed WV-2 Radar Super Constellations operate, and the weather at Argentia is, for the most part, absolutely awful. Annual rainfall is upwards of 60 ins.; in winter there's hail and sleet and the wind makes Argentia one of the few places in the world where it "snows horizontally." In summer, there's more rain and, 23% of the time, fog. Only infrequently is there a bit of sun to lighten a rugged landscape.

There's a saying at Argentia that goes "If we can taxi, we can fly." And that's just about how the flight crews operate. Refueling operations have been conducted in 85-kt. winds in order that flight operations may proceed—under the same conditions. On occasions, the man doing the refueling has had to don a parachute harness, and throw lines over the wing leading and trailing edges so that he could be held down while filling the tanks. Hangars are being built so that such operations can be conducted under cover.

Flight crews board the aircraft in the big "Miami" hangar, the engines are started inside, and the plane is taxied out. In winter, it has been necessary to free the ice-bound hangar doors with a bulldozer. Snowplows have had to clear the way ahead of the aircraft as it taxied to the runway for takeoff. Day or night, as long as the pilots can see two lights down the runway, they take off.

OUT ON BARRIER PATROL, multi-million dollar WV-2 Radar Super Constellation flies over surface counterpart, radar picket ship USS Sellstrom.

RADIO, RADAR, TACAN, LORAN or celestial navigation may be used to plot position on Barrier.



atr eeps Flying

Airlines operate the Super Constellation at a gross takeoff weight of 133,000 lbs. The Barrier squadrons operate it at 140,000 lbs.

In addition to two 600-gal. tip tanks, the big plane's fuselage houses a special tank holding 1,000 gals. of fuel, and an extra 67 gals. of oil are carried. Because the average patrol lasts a good 12 hours, two crews totaling 22 men are carried, and bunks and a galley are provided for off-duty crew members. Last, but by no means least, there's six tons of radar and electronic gear.

The electronics countermeasures equipment can detect radar and other electronic signals originating from another source, locate, and sometimes even identify, the source. The search radar scans an area of 45,000 square miles in a single revolution of the plane's antennae. Peak power of this search radar is 20 million watts, but the crew is protected by the skin of the aircraft.

The hold is crammed with "black boxes" and, in addition to countermeasures and other classified equipment, there are a half dozen search radar scopes in the Combat Intelligence Center (CIC) compartment. This equipment, along with navigation aids and radio gear, requires on-the-spot maintenance, so technicians are included in the crew to take care of normal failures and the not uncommon electrical fires.

The tremendous heat generated by all this gadgetry is quite a problem. On occasions, the flight engineer has had to select hot air for the cockpit while, at the same time, those aft are hounding him for full refrigeration. The air conditioning superchargers, each drawing 25 hp, can pump 0°C air at a rate of 70 lbs. per min., and ground crews recall times when, checking out the system with radar gear, etc. switched off, they've seen thick snow coming out of the cabin vents.

Directed by the CIC officer, the scope watchers plot all flying objects ("bogeys") picked up by the search radar. Speed, altitude, bearing and position are calculated and passed by the radio operator to operational control centers at Norfolk, Va., or back at Argentia. If these centers cannot identify a bogey by comparison with information they have on known friendly aircraft, they relay the details to North American Air Defense Command at Colorado Springs. From the time the bogey is spotted the chain of action takes less than 10 mins.

But landing is the real test of the pilot's ability. The procedure at Argentia is to descend to 200 ft. and, if the ground can be seen from this altitude, go ahead and land. Pilots swear by the GCA (Ground Controlled Approach) operators and, hoping for a hole in the weather, try as many as three such approaches before diverting to an alternate. Some even go so far as to say that, if Argentia did not have the best GCA crews in the world, the Barrier just couldn't be manned adequately from this base.

IN CIC COMPARTMENT, CIC officer works at status board by plotting table while asst. (near right scope) directs operations.

GCA EQUIPMENT is manned by experts. Pilots are "talked down" past rugged hills for landing even in zero-zero weather.

Marine Aviation—Combat in a Package

Any question as to what Marine Corps aviation is, does or has, should be preceded by a look at "why?".

The Marine Corps is required to provide landing forces of combined arms for the conduct of operations essential for the successful prosecution of naval campaigns. It is also required to provide Marine forces in immediate readiness to implement any directive of the President.

The missions of Marine Corps aviation are to provide air support for the ground components of the Fleet Marine Forces in the execution of any missions assigned, and a collateral mission to constitute augmentation of carrier-based air units of the Navy. These missions make it necessary that aircraft and equipment are procured, personnel are trained, and effort is expended in order to provide a "complete package" of tactical aviation.

This "complete package" is equally distributed among three Marine Aircraft Wings. Each Wing contains units and equipment to perform four basic functions:

1. Air Defense—to provide the landward extension of the amphibious task force air defense system, to include the facilities for the detection, identification and destruction of enemy airborne threats.

2. Offensive Air Support—to provide a variety of air-to-surface attacks against enemy installation and personnel for direct support of the landing force.

3. Air Transport—to provide assault airlift (both fixed and rotary wing) for the movement of personnel and high priority cargo into and within an amphibious objective area.

4. Aerial Reconnaissance—to provide visual, photographic and electronic aerial reconnaissance which is immediately responsive to the requirements of landing force.

In order to perform the four functions, each Marine Aircraft Wing now has 17 tactical combat squadrons, each equipped with an airplane specifically designed to perform one of the functions. Experience and repeated detailed study have shown the best "mixture" of different type squadrons to be: Five Air Defense Interceptor Squadrons, four Ground Attack Squadrons, two Aerial Reconnaissance Squadrons, two Assault Transport Squadrons and four Helicopter Transport Squadrons.

Of the five interceptor squadrons, two are all-weather fighter squadrons. These units are equipped with the Douglas F4D-1 Skyray.

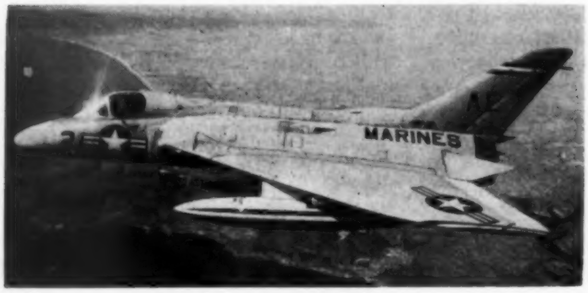
The other three interceptor squadrons are called day fighter squadrons. These units are currently phasing into the new supersonic fighter, the Chance Vought F8U-1 Crusader.

The four ground attack squadrons are now being equipped with the lightweight but effective attack airplane, the Douglas A4D-2.

Of the two aerial reconnaissance squadrons, one performs visual aerial reconnaissance. It is equipped with the small grasshopper aircraft, the Cessna OE-1.

The other reconnaissance squadron is a composite unit, performing electronic and photographic reconnaissance. It is equipped with the Grumman F9F-8P for the photograpic reconnaissance, and the electronic reconnaissance airplane is the Douglas F3D-2Q.

The helicopter squadrons are the newest members of the Marine Corps aviation team. Each Wing has three squadrons equipped for the primary task of transporting personnel. These units operate the Sikorsky HUS-1. The fourth helicopter transport squadron operates the HR2S with the primary task of transporting cargo.



Douglas F4D-1° Skyray

TYPE: Single-place, single-jet, carrier-based interceptor. DIMENSIONS: L—44′ 4″; span—33′ 6″; H—13′. WEIGHTS: Gross—approx. 25,000 lbs. POWERPLANT: Pratt & Whitney J57-P-2; rating—approx. 10,000 lbs. st. plus afterburner. PERFORMANCE: Max. speed—over 700 mph. All other data classified. ARMAMENT: Unspecified number of 20 mm cannons and rocket packages. Provision is made for underwing fuel tanks or bombs. MFR: Douglas Aircraft Co., Inc., El Segundo, Calif.

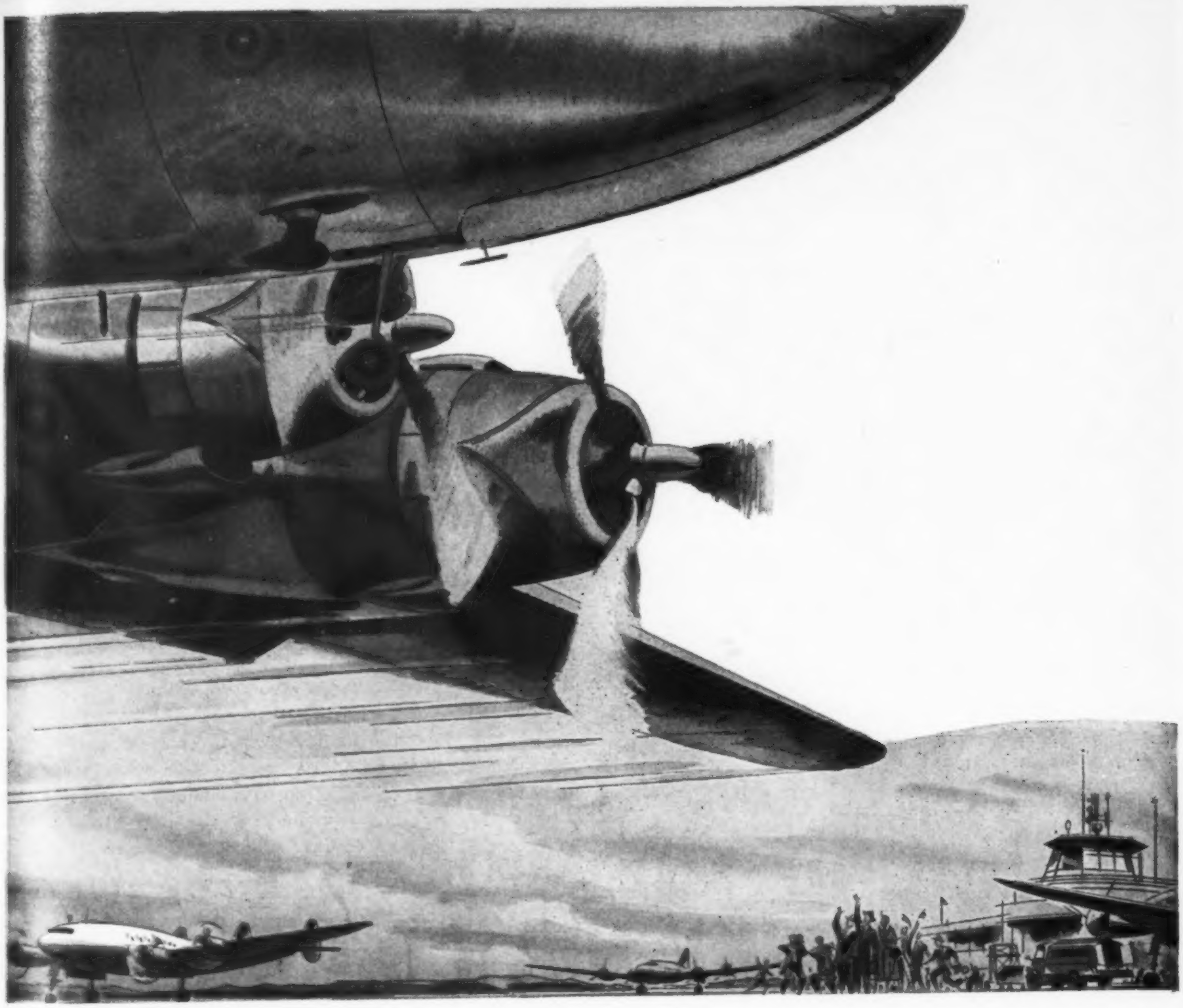
Chance Vought F8U-1 Crusader

TYPE: Single-place, single-jet, carrier-based day fighter. DIMENSIONS: L—54′ 3″; span—35′ 8″; H—15′ 9″. WEIGHTS: No data available. POWERPLANT: Pratt & Whitney J57-P-4; rating—over 10,000 lbs. st. plus afterburner. PERFORMANCE: Max. speed—over 1,000 mph. All other data classified. ARMAMENT: 4 x 20 mm cannons, 32 x 2.75-in. rockets and 2 Sidewinder missiles. REMARKS: F8U-2, advanced version of the -1, now is in production. MFR: Chance Vought Aircraft, Inc., Dallas, Tex.

Douglas A4D Skyhawk

TYPE: Single-place, single-jet, carrier-based light attack bomber. DIMENSIONS: L—39′ 1″; span—27′ 6″; H—15′ 2″. WEIGHTS: Empty—3,300 lbs.; gross—15,000 lbs. POWERPLANT: Wright J65-W-4; rating approx. 7,200 lbs. st. PERFORMANCE: Max. speed—over 700 mph; range—over 1,000 mi. ARMAMENT: 2 x 20 mm cannons with provision for external stores such as bombs, torpedoes, missiles and nuclear weapons. REMARKS: Versions of the Skyhawk in service with the Marine Corps are the A4D-1 and A4D-2.

(Continued on page 48)



FIRE FIGHTING S-58—Approaching a blazing gasoline fire, a Sikorsky S-58 delivers aerial fire fighting rig and personnel in a demonstration of the helicopter's capabilities in fighting fires, especially those hard to reach by ground transport. Downwash from rotor blades helps suppress or extinguish fire and protects firemen from intense heat. This unit, carrying 250 gallons of foam, was designed by American LaFrance in cooperation with Sikorsky Aircraft.

AROUND THE WORLD WITH SIKORSKY HELICOPTERS

CHOPPER JOHN—Twin-engined Army H-37s (Sikorsky S-56s) airlifted Honest John missiles, launchers, and crews at Project AMMO, a missile demonstration at White Sands, New Mexico, and Fort Bliss, Texas, to show how helicopters provide mobility for Army missiles under combat conditions. Other Sikorskys flying at Project AMMO were H-34s (S-58s) and H-19s (S-55s).

DEEP FREEZE III—In the Antarctic, large Sikorsky S-58s have joined the S-55s widely used for the past three years in U. S. activities supporting the International Geophysical Year. Their duties include passenger and cargo transport, reconnaissance, and search and rescue. The version of the S-58 shown above, the Navy HUS-1A utility configuration, is transporting cargo in Little America.


TAIL WHEEL LOCK

Grumman F9F-8 Cougar

TYPE: Single-place, single-jet, carrier-based fighter. DIMENSIONS: L—41′ 7″; span—34′ 6″; H—12′ 3″. WEIGHTS: Gross—approx. 20,000 lbs. POWERPLANT: Pratt & Whitney J48; rating—approx. 7,000 lbs. st. PERFORMANCE: Max. speed—over 650 mph; max. range—over 1,000 mi. ARMAMENT: 4 x 20 mm cannons. REMARKS: The Cougar succeeded the straight-wing Panther. Other versions of the Cougar are: F9F-6, F9F-6P, F9F-7 and F9F-8T. MFR: Grumman Aircraft Engineering Corp., Bethpage, L.I., N.Y.

→

Douglas F3D Skynight

TYPE: Two-place, twin-jet, carrier-based all-weather fighter. DIMENSIONS: L—45′ 6¼″; span—50′; height—16′ 6″. WEIGHTS: Empty—18,160 lbs.; gross—27,000 lbs. POWERPLANTS: (2) Westinghouse J34-WE-36; rating—3,400 lbs. st. PERFORMANCE: Max. speed—560 mph; initial rate of climb—2,500 fpm; combat radius—600 mi. ARMAMENT: 4 x 20 mm cannons with provisions for rockets, bombs and other external stores under the wings. REMARKS: Production Skynights were designated F3D-1 and -2. MFR: Douglas Aircraft Co., Inc., El Segundo, Calif.

Cessna OE-2

TYPE: Two-place, single-engine observation and reconnaissance plane. DIMENSIONS: L—25′ 0″; span—36′ 0″; H—7′ 6″. WEIGHTS: Empty—1,853 lbs.; gross—2,650 lbs. POWERPLANT: Continental 0-470-2 (supercharged); takeoff hp—265. PERFORMANCE: Max. speed—180 mph; cruise—156 mph; range—1,150 mi.; ARMAMENT: 250-lb. bomb or three rockets. REMARKS: Advanced version of OE-1, equipped to lay telephone wire, drop supplies, lay smoke screens, etc. MFR: Cessna Aircraft Co., Wichita, Kan.

Sikorsky HUS-1

TYPE: Two-crew, 12-passenger, single-engine, single-rotor, general purpose helicopter. DIMENSIONS: Rotor diam.—56′; length—46′ 9″; height—15′ 10″. WEIGHTS: Empty—7,630 lbs.; gross—13,000 lbs. POWERPLANT: Wright R-1820 rated at 1,525 hp. PERFORMANCE: Max. speed—123 mph; cruise—98 mph; rate of climb—1,075 fpm; range—195 mi. REMARKS: Marine Corps version of the commercial S-58. MFR: Sikorsky Aircraft Div., United Aircraft Corp., Bridgeport, Conn.

←

Sikorsky HR2S-1

TYPE: Twin-engine, single-rotor cargo/transport helicopter. DIMENSIONS: Rotor diam.—72′; length—60′; height—17′ 1″. CAPACITY: 36 troops, 24 litters, or 9,149 lbs. of cargo. WEIGHTS: Empty—21,240 lbs.; gross—31,000 lbs. POWERPLANT: (2) Pratt & Whitney R-2800 derated to 1,900 hp. PERFORMANCE: Max. speed—140 mph; cruise—115 mph; rate of climb—990 fpm; range—not available. REMARKS: The HR2S is one of the first helicopters to be equipped with retractable landing gear. MFR: Sikorsky Aircraft Div., United Aircraft Corp., Bridgeport, Conn.

←

Kaman HOK-1

TYPE: Five-place, single-engine, twin-rotor observation helicopter. DIMENSIONS: Rotor diam.—47′; length—25′; height—11′ 10″. WEIGHTS: Empty—4,040 lbs.; gross—6,800 lbs. POWERPLANT: Pratt & Whitney R-1340 rated 600 hp @ 2,700 rpm. PERFORMANCE: Max. speed—110 mph; cruise—93 mph; rate of climb—1,580 fpm; range—220 mi. REMARKS: Observation version of HUK-1 utility helicopter used by Navy. MFR: Kaman Aircraft Corp., Bloomfield, Conn.

BENDIX* IGNITION SYSTEMS—FOR THE BEST IN JETS

The powerful Curtiss-Wright J65 jet engine shown here is equipped with the Bendix TMGLN ignition system, the first self-contained ignition system to be developed for jet engines.

Produced by Scintilla Division of Bendix Aviation Corporation, it is one of a variety of types of ignition systems designed and manufactured by this division for the large, modern turbojet and turboprop engines.

The Curtiss-Wright J65 is one of the outstanding high-performance jet engines in service today and provides the power for a variety of high-performance military aircraft.

Canadian Affiliate: Aviation Electric Ltd., 200 Laurentien Blvd., Montreal 9, Quebec.

*TRADEMARK

Scintilla Division
SIDNEY, NEW YORK

Bendix
AVIATION CORPORATION

Circle No. 113 on Reader Service Card.

Adm. Arleigh A. Burke
Chief of Naval Operations

Who's Who In United S

Adm. James S. Russell
Vice Chief of Naval Operations

VAdm. Robert B. Pirie
Deputy Chief of Naval Operations (Air)

RAdm. Clifford S. Cooper
Asst. Chief of Naval Operations (Air)

RAdm. William E. Gentner, Jr.
Director, Aviation Plans, Office of CNO

RAdm. Robert E. Dixon
Chief, Bureau of Aeronautics

RAdm. Paul D. Stroop
Chief, Bureau of Ordnance

RAdm. James R. Lee
Deputy Chief of Naval Personnel

RAdm. Ray C. Needham
Asst. Chief of Personnel Control

Adm. Walter F. Boone
US Rep. to Military Committee, NATO

VAdm. Thomas S. Combs
Commander, Eastern Sea Frontier

VAdm. Stuart H. Ingersoll
President, Naval War College

Adm. Harry D. Felt
Commander in Chief, Pacific

VAdm. Herbert D. Riley
Chief of Staff, CinCPac

VAdm. William V. Davis, Jr.
Chief of Staff, CinCLant

VAdm. Alfred M. Pride
Commander, Naval Air Forces, Pacific Fleet

VAdm. William L. Rees
Commander, Naval Air Forces, Atlantic Fleet

VAdm. Clarence E. Ekstrom
Commander, Sixth Fleet

VAdm. Frederick N. Kivette
Commander, Seventh Fleet

RAdm. Henry H. Caldwell
Commander, Carrier Division One

RAdm. Kenneth Craig
Commander, Carrier Division Two

RAdm. William A. Schoech
Commander, Carrier Division Three

RAdm. Roy L. Johnson
Commander, Carrier Division Four

RAdm. Ralph S. Clarke
Commander, Carrier Division Five

RAdm. George W. Anderson, Jr.
Commander, Carrier Division Six

RAdm. Leonard B. Southerland
Commander, Carrier Division Seven

RAdm. Edward A. Hannegan
Commander, Carrier Division Fourteen

States Naval Aviation Today

RAdm. Frank A. Brandley
Commander, Carrier Division Fifteen

RAdm. John S. Thach
Commander, Carrier Division Sixteen

RAdm. Almon E. Loomis
Commander, Carrier Division Seventeen

RAdm. Reynold D. Hogle
Commander, Carrier Division Eighteen

RAdm. Edward E. Colestock
Commander, Carrier Division Nineteen

RAdm. Emmet O'Beirne
Commander, Carrier Division Twenty

VAdm. Robert Goldthwaite
Commander, Carrier Chief of Naval Air Training

RAdm. Joseph M. Carson
Chief of Naval Air Basic Training

RAdm. Fitzhugh Lee
Chief of Naval Air Technical Training

RAdm. Joseph C. Clifton
Chief of Naval Air Advanced Training

RAdm. Allen Smith, Jr.
Chief of Naval Air Reserve Training

RAdm. John Perry
Commander, Fleet Air, Whidbey

RAdm. Wendell G. Switzer
Commander, Fleet Air, Jacksonville

RAdm. Robert F. Hickey
Commander, Fleet Air, Hawaii

RAdm. Frank Akers
Commander, Fleet Air, E. Atlantic and Med.

RAdm. Murr E. Arnold
Commander, Fleet Air, Alameda

RAdm. Lester K. Rice
Commander, Fleet Air, Quonset Point

RAdm. William M. Nation
Commander, Fleet Air, Western Pacific

RAdm. William A. Sutherland, Jr.
Commander, Fleet Air Wings, Atlantic

RAdm. Thurston B. Clark
Commander, Naval Air Test Center

RAdm. Jack P. Monroe
Commander, Naval Air Missile Test Center

Lt. Gen. Verne J. McCaul
Asst. Commandant, US Marine Corps

Maj. Gen. John C. Munn
Director of Aviation, ComMarCorps

Maj. Gen. Samuel S. Jack
Commanding General, Air FMF, Pacific

Maj. Gen. Marion L. Dawson
Commanding General, Air FMF, Atlantic

Brig. Gen. Charles H. Hayes
Commanding General, 1st Marine Air Wing

Maj. Gen. Arthur F. Binney
Commanding General, 2nd Marine Air Wing

Maj. Gen. Thomas G. Ennis
Commanding General, 3rd Marine Air Wing

Brig. Gen. Edward C. Dyer
Commanding General, Marine Corps Air Station, Cherry Point

Brig. Gen. Ronald D. Salmon
Commanding General, Marine Corps Air Station, El Toro

tec niques. A nickel-chromium-tungsten alloy, Ni otung has the best high-temperature strength of nown super-alloys and may be cast readily into int ate shapes.

hese are two examples of Westinghouse leadershi in metallurgy for improved airborne propulsion sys m performance.

T ke advantage of this ability to design, test and pro uce outstanding products for all phases of jet pr ulsion. Contact your Westinghouse sales engine r write the Westinghouse Aviation Gas Turbine Di ision, P. O. Box 288, Kansas City, Missouri.

J-54048

YOU CAN BE SURE...IF IT'S

Westinghouse

Circle No. 114 on Reader Service Card.

Naval Aviation Depends on BuAer . . .

. . . for it is this agency that must make the right decision on the purchase of equipment. The "investment counselors" for Navy air, it's their job to see that the right aircraft and accessory gear are made available—for both present and future needs.

They Pay the Money and Make the Choice

An airplane is an airplane, but the Navy flight article differs from other combat airplanes in important respects.

Naval aircraft design requires almost as much consideration of the sea as ships themselves. They must fly from the surface of the sea, from ships at sea, or over the sea from fields close to the sea. This places them in a salt air and water environment which spells trouble from the beginning in terms of corrosion, galvanic action and moisture. Even soot and smoke from a carrier's stacks are damaging.

Structurally, naval aircraft operating from carrier decks must have extra ruggedness factors built into them to withstand the physical shocks of arrested landings and initial catapult launch forces.

Yet when airborne, these beefed-up airplanes must be able to compete with the highest performance land-based planes—planes which are designed and built with little or no handicapping where take-off and landing space and speeds are concerned.

In short, the sea environment and the ability to take beatings that would tear other airplanes apart are challenging requirements for the designer of naval aircraft.

The Navy, and particularly BuAer since its beginnings in 1921, have continually refined and adjusted their design and contracting techniques with one purpose in mind: to place the best possible air weapons in the hands of the Fleet.

• The weapon system concept—Currently, BuAer approaches the design and procurement of naval aircraft on a modified weapon systems basis. A system is thought of from the beginning as an integrated thing including all components and operational support items. The widest possible source selection is maintained, and fairly tight reins are kept on design detail due to the unique sea and shipboard operational environment.

But before a material bureau of the Navy such as BuAer can go ahead with the development of an air weapon system, it must have a charter or directive from a higher authority, the Chief of Naval Operations. This comes to the bureau from CNO in the form of an Operational Requirement.

Operational Requirements describe the military operational need for a particular weapon system according to mission, ASW, Attack, or Air Defense. The Requirement calls out combat and flight characteristics, and the climate in which the system will perform. It includes background information, comments on the system's compatibility with other systems, first availability dates, and the life-span of the system in terms of service use.

Although the language of the Requirement is quite general, it is supplemented by more detailed Development Characteristic data. The Development Characteristic spells in greater detail and technical authority specific "numbers" and performance dimensions of the weapon system.

• Idea melting pot—Although the "getting out" of an Operational Requirement with its Development Charteristics summary is the charge of CNO, many elements go into the shaping of it.

A main source of information about needed weapon systems is the Fleet itself—the people who will operate them and fight with them. Also authoritative are the offices of CNO on whom rests the responsibility for overall formulation of tactics and strategy, and for initial prosecution of programs involving design and procurement of air weapon systems.

Another element is the aircraft industry itself which often comes forward with new ideas and developments, and which always is the best commentator on its own production capabilities.

Another element is the "possibilities envelope" offered by the basic technologies and sciences. In the business of naval air weapons development, much reliance is placed upon the findings and opinions of research and engineering personnel in BuAer, and out in front of them, in time, are the scientists of ONR, private laboratories, the universities, and industrial R&D.

One final element is considered in the forming of an Operational Requirement, and it is blessing or bind depending on which color of ink is used—money.

• Building an airplane—With an Operational Requirement in hand, BuAer then sets in motion a chain of design and procurement events which ends with quantity production and Fleet use of the air weapon. The Bureau studies the Requirement in great detail to determine an optimum way to meet it. The result is an outline specification for the system which brings the needed weapon system into engineering and design focus. Included are detailed estimates of weight and performance, probable components, support facilities required, production features, and all other available data which could influence the design.

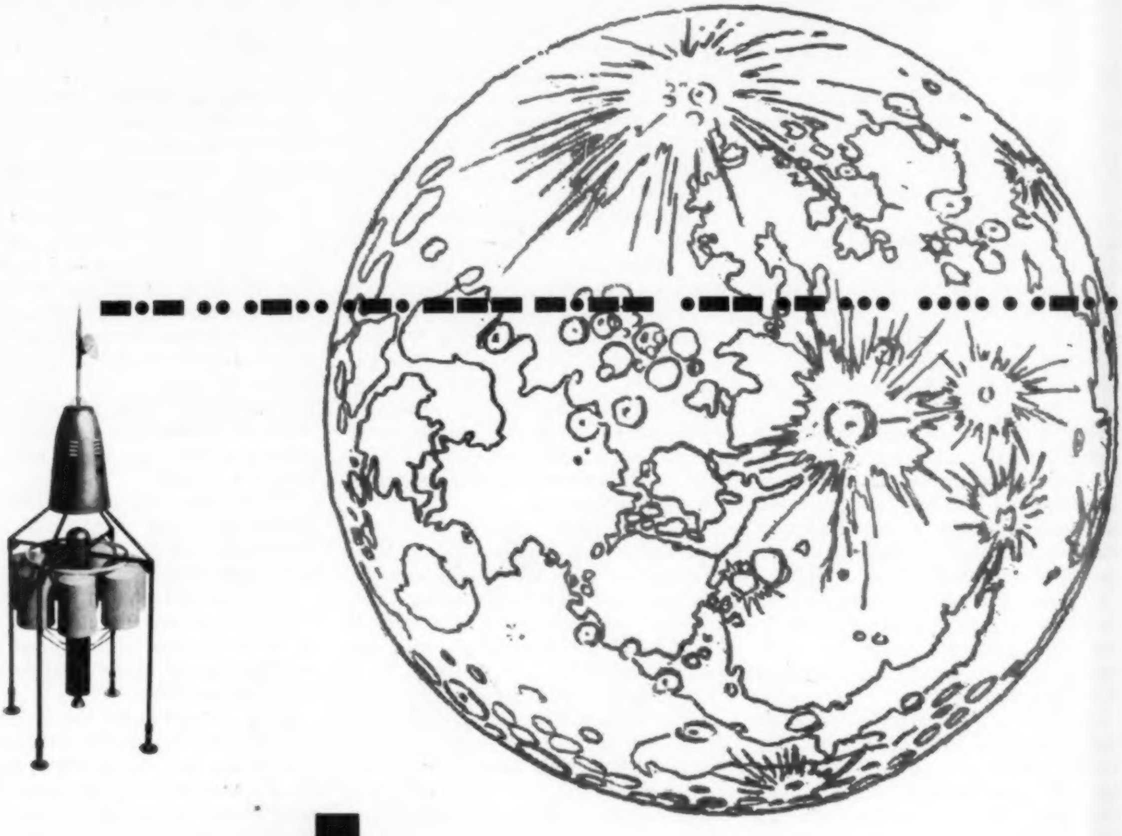
When the outline specification is agreed upon by the Chief of the Bureau and his Assistant Chiefs, BuAer is ready to find a builder.

If the air weapon to be procured is a new major system such as a fighter or attack airplane, or a guided missile, an open manufacturer's design competition is conducted.

If the Requirement can be met with a transport, trainer, or utility aircraft which may have been previously built by a manufacturer, or developed by another service, the source may be limited to those contractors who have a flying model meeting the specs. Where the system is the outgrowth of an existing model, a contract may be negotiated directly with its manufacturer. Where a contractor has designed a system which so uniquely and ingeniously fulfills a standing requirement that he is far ahead of all competitors, he may also receive a direct contract.

• Design competition—But in the case of a new major system, manufacturers are asked to submit to BuAer their detail design proposals to meet the outline specification. A recent fighter competition saw as many as eight proposals from 15 invitees. The preparation of detail designs by the manu-

From Normandy to Eniwetok, P. F. C. Joseph Willie Kilroy was there... and he'll be out there somewhere when man in space is commonplace! To-day, the top astroscientific and missile engineering teams in the country are already at work on the fundamental problems of space exploration and the manned orbit vehicle. One of those top teams is at Martin—with 30,000 engineering man-years of experience in missile and space system pioneering.



. . . Buying an airplane

facturer represents a great labor and money investment. BuAer holds that the prospective contractor is entitled to enough knowledge of the Navy program for which the system is planned and the environment in which the system will perform to enable him to make sound decisions on the business risk he is undertaking.

Traditional Navy procurement policies include the vital aspect of fair and impartial treatment for all potential suppliers. This is rigidly followed.

Upon the receipt of the detail design proposals from the aircraft industry, which normally is about three months from the time bid proposals are asked, a detail evaluation is commenced.

Controlled and coordinated by a group of specialized evaluation engineers, the examining of manufacturer's designs entails a comprehensive study of comments made by bureau specialists in specific engineering areas. Bureau technical authorities for powerplants, avionics, structures, airborne equipment, aerodynamics, weight support facilities, and other pertinent phases of the design submit their views. From these a final evaluation as to the best design proposal to meet the outline specification is made. A normal time for reaching a procurement decision is approximately four months.

The competition winner is formally announced by the Chief of the Bureau, usually after consultation with the Deputy Chief of Naval Operations for Air, and the Assistant Secretary of the Navy for Air.

Contracts for systems hardware are then let, usually for five to eight flight articles for testing in the case of an experimental airplane.

Performance of the contractor in the manufacture of his winning design is the chief concern of a BuAer Program Manager assigned the particular system. Assisting the Program Manager is a weapon systems team of R&D project engineers, again chosen for the specific system under contract. The Program Manager sticks with the weapon system through developmental and quantity production, through Fleet introduction, modification, service life, and final retirement from operational use.

Identical procedures are employed by BuAer for the design control and procurement of guided missile systems.

As previously noted, BuAer's "system" for providing the Fleet with advanced air weapon systems is the result of years of experience. Most recent adjustment has been to realign to the systems concept. The result is both flexible and highly effective.

THE BOEING 707 STRATOLINER (above) is designed for medium to long-range routes; the 707 Intercontinental, for over-ocean routes, and the 720 for short-to-medium range routes. All will bring unprecedented passenger comfort to the world's airlanes.

PASSENGERS WILL RELAX in luxuriously comfortable cantilevered chairs that provide unobstructed leg room. Built-in opaque window shades will cut any undesirable glare.

GALLEYS ARE LOCATED both forward and aft for efficient, flexible food service for up to 189 passengers. On ground, galleys are quickly serviced through special hatches.

IN SPACIOUS 707 AND 720 CABINS, passengers will enjoy a ride totally free of fatigue-inducing vibration. At night, ovalled dome lights create the illusion of star-flecked sky. Windows—twice as many per seat row as in conventional airliners—provide unobstructed view even from aisle seats. Overhead passenger service units contain reading lights, call buttons, individual speakers. Ventilation system changes air rapidly without draft. Movable bulkheads and seats set in tracks can be changed to any combination of 4, 5 or 6-abreast seating to meet all competitive situations.

707 AND 720 CABINS provide for club-like lounges forward and aft. They can be replaced by additional seating. Boeing jetliners combine passenger-pleasing luxury with economical flight and maintenance features that add up to profitable operations for airlines.

BOEING

Family of jet airliners

These airlines already have ordered Boeing jetliners: AIR FRANCE • AIR INDIA AMERICAN • B.O.A.C. • BRANIFF • CONTINENTAL • CUBANA • LUFTHANSA • PAN AMERICAN QANTAS • SABENA • SOUTH AFRICAN • TWA • UNITED • VARIG • *Also* MATS

A First-Class Naval Air Arm Demands . . .

. . . First-Class Research and . . .

The Office of Naval Research, established by Congress in 1946, is the agency in the Navy which supports the basic and fundamental research leading to the development of our Navy. Six of the seven research divisions in ONR are concerned with earth sciences, material sciences, mathematics, biology, and psychology.

The seventh division is called naval sciences, which gathers and exploits new knowledge gained from research with the aim of providing the Navy with a fund of new ideas for advanced development work. One of its branches is devoted to research and development in air warfare. The mission of the air branch is to stay constantly in the vanguard of new ideas in naval aviation and speed up their transfer into military equipment.

• **Research for the present**—The air branch takes the lead in finding broader and more flexible roles for both fixed and rotary-wing aircraft and for lighter-than-air vehicles. For example, the development of helicopters and blimps, together with vertical and short takeoff and landing aircraft, and the investigation of low-speed flights have all been spurred by the urgent need to make radical improvements in air warfare capabilities. The air research program is also concentrating on the ever increasing problems in anti-submarine warfare.

• **Research for the future**—Although some aeronautical research carried on by the Navy is designed to meet immediate needs, our major objective is to find out the kind of air vehicles we will need ten years from now, and what kind we can get. We also have long-range programs in which our purpose is to establish farsighted research projects in those potentially important areas where development has not yet begun. An example is the Navy's program in rarefied gas dynamics research. This program has its major implication well into the future, at a time when we can seriously consider upper atmosphere flight in terms of sustained cruising instead of highly transient, nearly vertical sorties. At the same time, the Navy is participating in the support of the X-15 project.

• **Research for the near and far future**—In some cases, the same research program may have both a short-term or interim goal and a long-range goal. This happens when the need is so pressing that we move immediately into what we call exploratory development—that is, we try out the new idea with actual hardware in an interim system.

A prime example is the Navy's program, jointly supported by the Army, for the development of a revolutionary integrated aircraft cockpit instrument system. The genesis of this program was the recognition that present instrument displays are inadequate and are becoming increasingly complicated. The long-range goal is to enable pilots to fly fixed and rotary-wing aircraft by instruments as simply as under visual conditions, avoiding the complex integration of instrument readings.

Begun by the Navy five years ago, we are now completing the exploratory development of an interim system in which the basic components are two flat television-type picture tubes—one of them transparent and installed in the windshield position—and a compact computer that takes up 0.6 cubic feet of space. The TV picture tubes, which will replace many of the instruments in the cockpit, will present a synthetic picture, with the information generated by the computer, that will give the pilot some aspects of visual flight. The transparent screen in the windshield will feature the display of a ribbon-like pathway or highway along which the pilot literally flies and which tells him at a glance whether he is flying safely and on course. In its ultimate development the pathway will steer him away from mountain tops, avoid putting him in the path of other aircraft with which he might collide, and also guide him in making landings and takeoffs. The basic components have already been flight tested in a jet training aircraft. The concept is also well suited to space navigation.

• **Research in the upper atmosphere**—Another important phase of the Navy's aeronautics research program is upper atmosphere research. This is a field in which the Navy has pioneered, particularly in the use of research rockets and high altitude plastic balloons. Both rockets and balloons are designed to transmit to us more accurate information on air density, pressures, temperatures, light diffusion, cosmic radiation, and gravity at great heights. This is a necessary preliminary to flight at extremely high altitudes or into space.

Navy-developed rockets used for this research have been the Viking, the Aerobee-Hi, and the balloon-launched Deacon. Unmanned balloons in the Navy's Skyhook project, under way since 1946, have reached heights of about 25 miles. In recent years, manned balloons in our Strato-Lab project have carried a pair of naval observers with their instruments high into the stratosphere to heights of about 86,000 feet, and they have been able to remain in the upper air for as long as 34 hours.

. . . Development

One of the U.S. Navy's principal sources of research and development in Naval Aviation is the Naval Air Development and Material Center (NADMC), Johnsville, Pa., commanded by Rear Admiral J. N. Murphy. It includes four principal developmental activities:

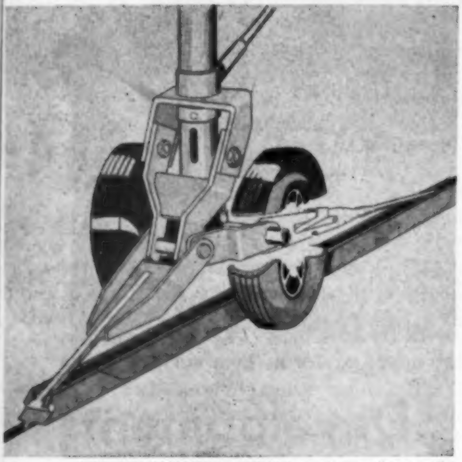
1. Naval Air Material Center in Philadelphia, Pa.
2. Naval Air Development Center, Johnsville, Pa.
3. Naval Air Turbine Test Station, Trenton, N.J.
4. Naval Air Test Facility (Ship Installations), Lakehurst, N.J.

The Naval Air Material Center (NAMC) includes several laboratories.

Work at the *Naval Air Engineering Facility* (*Ship Installations*) is concentrated on the problems associated with launching and arresting carrier aircraft. An approach to the problem of increasing weight of aircraft and faster launching and landing speeds, is known as the "nose wheel tow" system. This device uses an integral tow bar which is a permanent part of the aircraft nose wheel. The tow bar is designed to follow a simple track in the flight deck during spotting and brings the aircraft into exact position at the launching shuttle.

The new scheme eliminates the need for highly accurate spotting on the catapult because of the directional stability inherent in this method of launching. There is no launching bridle or pendant to interfere with external stores or to cause damage to the airplane or stores during bridle separation and capture. Fewer flight deck personnel will be required during the launching operation and personnel will no longer be required to work near jet intake or exhaust.

The *Aeronautical Engine Laboratory* of NAMC is concerned with the problems of aircraft powerplants, powerplant components, associated accessor-



NOSE WHEEL TOW system is a development that makes launchings safer.

ies, and fuels and lubricants. Projects range through evaluation of the J33-A-24 engine, gas turbine engine calibrations, exhaust noise investigation, starters and generators, fuel controls, secondary powerplants, piston engine ignition and micro pump studies.

The *Air Crew Equipment Laboratory* of NAMC works chiefly in the field of aviation medicine. Emphasis is placed on the physiological and psychological aspects of aviation visual problems. Means of protection of aviation personnel from the hazards of flight are also sought.

A high-performance ejection catapult system has been developed that provides "on-the-deck" escape capability and can be installed easily as a retrofit or in new production aircraft.

The development of a miniature oxygen breathing regulator has exhibited a new concept in aircraft oxygen breathing systems. Because of the significant weight and space savings, the miniature regulator can be mounted on the aircrewman as part of his personal equipment. Antisuffocation and underwater breathing capabilities are being incorporated in the regulator.

The *Aeronautical Structures Laboratory* of NAMC conducts long-range structural research programs involving structural fatigue and aerodynamic heating, the determination of flight loads through flight statistical surveys of Fleet aircraft, and landing and catapulting loads resulting from carrier operations.

The task of the *Aeronautical Materials Laboratory* is to conduct research and development pertaining to materials and processes which enter into the construction, overhaul and maintenance of naval aircraft and related equipment.

To reduce the possibility of mid-air collisions, a high visibility red-orange fluorescent coating has been developed for use on aircraft; this red-orange color is one of the most, if not the most, visible of colors for the average person.

Relative to participation in the Aircraft Nuclear Propulsion Program, the laboratory is studying the effects of gamma radiation. Presently, the vulcanization of specially formulated rubber, the change in physical properties of rubber, and development of hull sealants by irradiation are being studied. Results to date indicate beneficial effects in vulcanization, and some improvements in the physical properties of rubber.

The Naval Air Development Center (NADEVCEN) at Johnsville also consists of a number of laboratories.

The *Aeronautical Instrument Laboratory* develops and evaluates flight and engine aircraft instruments. At present they are heavily involved in the Army-Navy Instrumentation Program which is directed toward developing an unambiguous, simplified display for the pilots of jet aircraft and helicopters.

The *Air Warfare Research Department* of the NADEVCEN conducts theoretical studies to indicate appropriate paths for future research and development, new and improved concepts for air warfare, and improvement of weapons systems, tactics and strategy.

This study group has a hard core of practical engineering, development and research background, so that the recomendations made to BuAer have a high degree of built-in confidence. This group has prepared studies on such diverse subjects as Interception of High Altitude Bombers, VTOL Turboprop Aircraft Operational Capabilities, Rocket Propulsion, Corvus Missile, Outer Perimeter Fleet Air Defense, Aircraft Nuclear Propulsion, etc.

The *Aeronautical Photographic Experimental Laboratory* concerns itself with the photographic requirements of Naval Aviation. During the past few years they have investigated and successfully developed miniaturized aerial reconnaissance cameras and accessory equipment. The resulting 70 mm equipment possesses the same degree of detailed information available in the 9" x 9" cameras.

The *Aviation Medical Acceleration Laboratory* concerns itself chiefly with the study of the effects of accelerations on the human. The world's largest centrifuge capable of exposing a man to 40Gs is available for this purpose. Investigations of the tolerance of the human for G forces as well as protection from them are conducted.

The *Aircraft Computer Laboratory* supplies analyses and the essential computing tools so necessary for the development of present and future complex weapons systems.

An interesting and productive joint program has been carried out by the Computer and Accelerations Laboratories. This program converted the giant Johnsville human centrifuge from a device which exposes a subject to a series of pre-determined acceleration patterns through which he rides merely as a passenger to a system which allows the subject to "fly" the centrifuge. This program has produced a dynamic flight simulator which can realistically simulate any desired aircraft even before it has been built. Recently, this system was used to simulate the G forces the pilot of the X-15 might experience on re-entry of the atmosphere.

The *Engineering Development Department* has played a prominent role in the design and development of target drones as well as certain guided missiles. They developed the F6F pilotless aircraft, guided by television, that attacked the lines of communication in the Korean action.

The *Aviation Armament Laboratory* works on every phase of the weapon delivery problem. This includes studies of weapons effectiveness and tactical problems as well as development projects which result in hardware.

The *Aeronautical Electronic and Electrical Laboratory* covers a wide gamut of endeavor in the field of avionics so vital to modern Navy Air. Radar, guidance, communications, countermeasures, electrical systems and sonar are among the principal developmental efforts. Of increasing importance and emphasis are developments in the field of antisubmarine warfare.

The Naval Air Turbine Test Station at Trenton has the mission of conducting tests and evaluations of aircraft engines and performing applied research and development in the aircraft propulsion field. The projects range in scope from altitude evaluations of the latest and largest Navy turbojet engines to inlet air distortion research and power control development investigations. On one of the largest turbojet engines they have demonstrated altitude guarantee points, both thrust and specific fuel consumption, for the first time. This makes it possible for BuAer to require contractors to guarantee altitude performance.

The Naval Air Test Facility (Ship Installations) at Lakehurst, New Jersey, is new and still in the process of construction. It will be capable of completely simulating ashore all of the shipborne launching and arresting gear including use of aircraft to test capabilities and limitations of equipment.

Cole-Vac Airfield Vacuum Cleaner*

Digitizer Brush (actual size)

Thinking and producing to any dimension...

ranging from the development of a wide variety of electro-mechanical, electronic, purely mechanical and hydraulic products — the Digitizer, the Electronic Dive Angle Control System, the Cole-Vac Airfield Vacuum Cleaner, and the Hydraulic Power Supply — to the complete design, construction and operating management of a supersonic test track.

Complete engineering service, military or commercial, for simple pieces of data handling equipment, or highly complex systems.

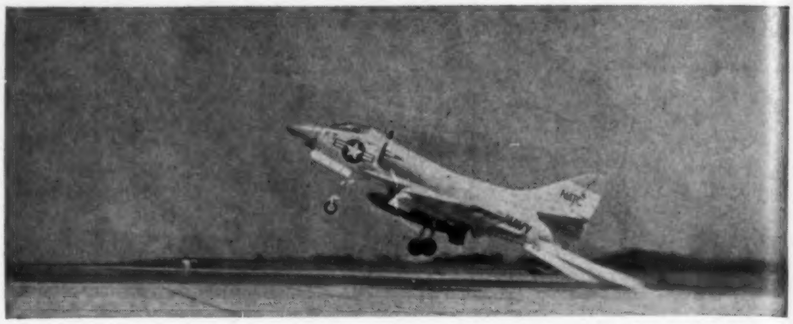
Coleman Engineering Company, Inc.

3500 Torrance Boulevard
Torrance, California
Washington, D.C., Dayton, Ohio;
Ft. Walton Beach, Florida

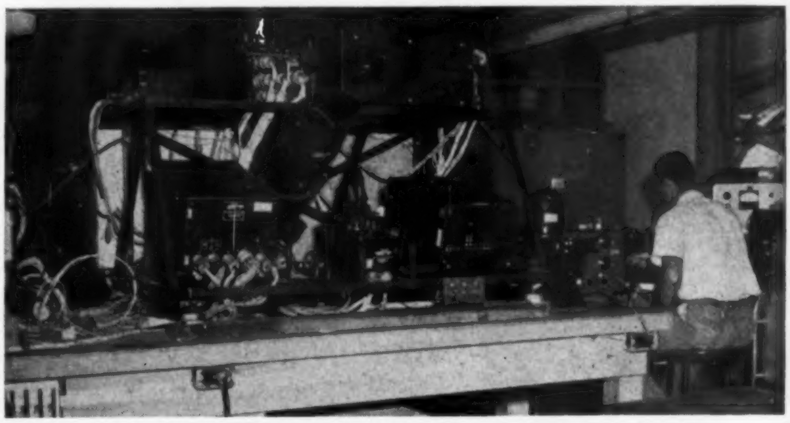
*Currently manufactured and sold commercially by Coleman's exclusive licensee, Fruehauf Trailer Company, Cole-Vac Division.

Circle No. 116 on Reader Service Card.

Patuxent River—Where th

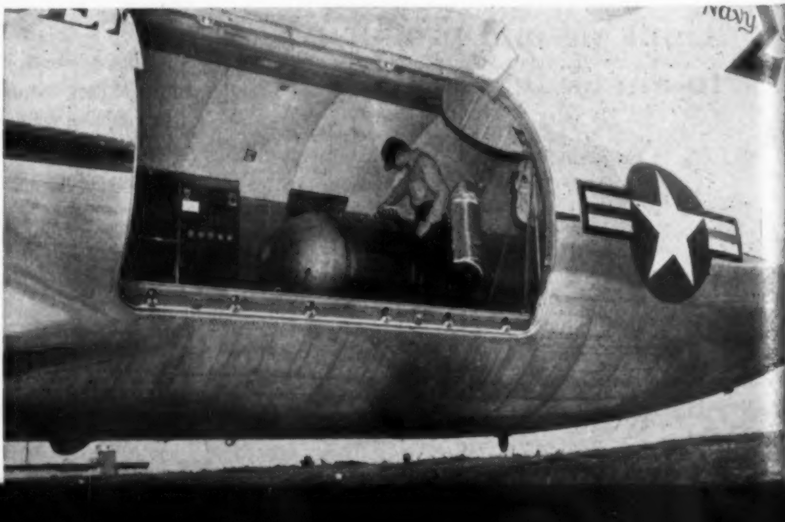


DOUGLAS A4D GETS FIRST TEST with Jato thrust augmentation at NATC.



ONE OF THE ELECTRONIC TEST STANDS for armament control units.

BIGGEST CARRIER COMBAT PLANE, Douglas A3D, fired from steam catapult.



avy Tests the Future

By Albert Bentz
Manufacturing/Military Editor

PATUXENT RIVER, MD.—It's a dull day when there aren't a dozen or more hot jets in air over this area getting a thorough "wringing out."

For it is here on a 6,800-acre peninsula at the confluence of the Patuxent with the Chesapeake Bay that Navy has established its Naval Air Test Center to evaluate its new aircraft and modification of the old.

In a way, it is the Navy's Edwards AFB, Eglin AFB and Wright Air Development Center all wrapped up into one. This is where the Navy tries to find and then iron out all the bugs in its aircraft before they reach the fleet. From the findings of its teams of aeronautical, electronics, hydrodynamics and other highly skilled experts come the final decisions on whether to buy.

The work done here is so intricate and important that NATC conducts a test pilot school to train its own fliers in the numerous jobs necessary to evaluate new aircraft. This is the tenth year the school has been in existence and the 21st class is now in session. Classes have been extended from the previous six-month course to eight months. Upon graduation, the pilots are assigned to one of the four test divisions at the base.

The test divisions are complete entities unto themselves. Each is given a complete job to do in its particular field. The divisions, each under direction of a Navy captain: Armament test, electronics test, flight test, service test.

Their duties:

• **Armament**—Test aircraft armament systems as to suitability for warfare and mechanical efficiency for operations. Tests involve ground evaluations of machineguns and rocket firing devices. There also are air tests to determine the accuracy of every armament feature in the airplane. This division also is responsible for tests of airborne targets, optical instruments and electronic equipment pertaining to armament.

• **Electronics**—Conduct trials of the overall aircraft to determine the electronics and electrical compatibility for its intended mission. Evaluations include the entire electrical installation, including radio and radar machinery, gun-fire parts, navigational aids, electric light devices and instrument flight aids. The division also tests ground and ship installation of navaids.

• **Flight**—Conduct flight trials, carrier suitability trials, aircraft and engine performance tests, suitability and control characteristics, and other trials to determine the flying qualities and service suitability of the aircraft and its components under actual flight conditions.

• **Service**—Determine serviceability of new aircraft before they reach the operating squadrons to ascertain that the plane is tactically sound. Division conducts extensive and comparative tests to determine overall capabilities and shortcomings of the aircraft from the point of view of the fleet pilot. Planes are flown under all types of conditions, day and night. Information obtained here enables BuAer to make any necessary modifications in production before the aircraft are delivered to the fleet in quantity.

The test pilot school itself is a division of the center.

• **The initial phases**—The Naval Air Test Center gets its first crack at a new aircraft within 90 days, or 30 to 60 flight hours, after the manufacturer puts it into the air for the first time. This first evaluation is conducted with heavy instrumentation supplied by the manufacturer. It is during this initial phase that the prospective buyer and the hopeful seller try to get together on a piece of merchandise that will live up to specifications laid down by the buyer. These tests usually are made at Edwards AFB or near the plant site of the manufacturer.

This evaluation is followed by an engineering and maintenance inspection on an early production model to determine if the manufacturer has complied with specifications related to safety, replacement of components, maintenance accessibility, adequacy of support equipment and suitability of physical installations of the systems.

Third phase is the Board of Inspection and Survey (BIS) preliminary evaluation. BIS is an overall organization that evaluates all equipment bought by the Navy. It is headed by Rear Adm. Richard F. Stout at the Pentagon. He is represented at NATC by Capt. Stratton R. Ours, Jr., who receives evaluation reports from the center's commander, Rear Adm. Thurston B. Clark, Jr.

When the aircraft gets to the BIS phase, the primary concern is with components, but one officer pointed out, "We look at a component only as it affects the entire aircraft."

The third phase testing is done at Patuxent and is completed in 60 days after delivery of one aircraft to each of the four major test divisions.

After this 60-day trial phase, there's a conference that proves mighty important to the manufacturer. It is attended by representatives from the Office of Chief of Naval Operations, Navy Fleets, BuAer, NATC, Aviation Supply Office, Marine Corps Headquarters and the contractors. This conference results in a decision on the fleet introduction program (FIP).

(Continued on page 64)

GE J85 TURBOJET is tested as auxiliary electronics power supply unit in Convair R4Y (240).

←

The FIP lasts for eight weeks, or 100 flight hours on each of six airplanes, and is carried out at the test center to introduce the new aircraft to fleet personnel.

A fleet introduction program conference then is held to compile deficiencies and recommendations on the new aircraft. The decision is made at this time as to actual delivery of fleet-configured aircraft. Last phase is fleet delivery.

However, the Board of Inspection and Survey trials continue during and even after the FIP and fleet deliveries.

The flight testing of all aircraft, equipment and components is carried on under directives both from BIS and BuAer. The test center actually is a part of BuAer.

There are four principal objectives in BIS directives to the center:

1. To determine whether procurement contracts for new models have been fulfilled satisfactorily.
2. To report all material, performance and design defects found, together with the opinion as to responsibility for making corrections.
3. To recommend design changes that should be made in the aircraft or in others of a similar type.
4. To recommend final acceptance or rejection of the aircraft to the Secretary of Navy.

• Inspection . . . and more—Why submit these reports to BIS and not to the contractor? Principally because that's the way Navy regulations read, but one NATC officer also made this point:

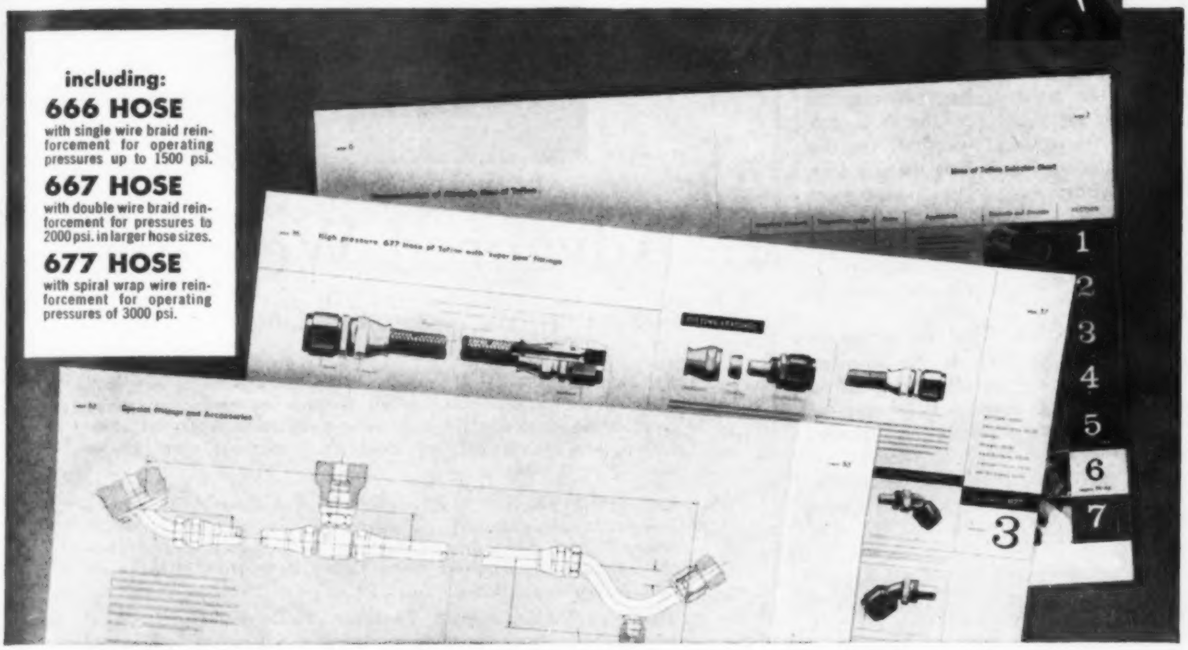
"We serve essentially an inspection function, a legal requirement placed on us. Somehow we have to determine in the Navy whether or not the contractor has done what his contract said he would do and what his specifications required him to do. It is entirely analagous to an inspection department in an industrial establishment. In most good industrial organizations the inspection department reports directly to management. It does not report to production or engineering.

"It is management's way of determining whether or not engineering and production have done the job that they were supposed to do. The inspectors inspect against either the customer's requirements which the manufacturer has agreed to meet or against the firm's own set of requirements that are established, and it gives management a check on how well they're doing. It prevents putting out an inferior product. This is the so-called "third party look," someone who is not responsible either to production or to engineering,

ONE OF MANY high altitude flying suits being evaluated by Navy at NATC.

New! A Complete Catalog on All Types of Aeroquip Hose of TEFLON

AND REUSABLE "*super gem*" FITTINGS (PATENTED)



including:

666 HOSE
with single wire braid reinforcement for operating pressures up to 1500 psi.

667 HOSE
with double wire braid reinforcement for pressures to 2000 psi. in larger hose sizes.

677 HOSE
with spiral wrap wire reinforcement for operating pressures of 3000 psi.

It's available NOW! It's free! This *complete* new 68-page catalog tells all about Aeroquip's extensive range of Hose Lines of TEFLON for air frame, engine and missile applications. Helpful information for design engineers includes technical and engineering data plus full specifications on *all* types of Aeroquip Hose of TEFLON, as well as both standard and special reusable "**super gem**" Fittings.

Send for your free copy of valuable, information-packed Catalog 103. Use the coupon below.

Aeroquip
REG. TRADEMARK

AEROQUIP CORPORATION, JACKSON, MICHIGAN
AEROQUIP CORPORATION, WESTERN DIVISION, BURBANK, CALIFORNIA
AEROQUIP (CANADA) LTD., TORONTO 19, ONTARIO

Teflon is DuPont's trade name for its tetrafluoroethylene resin
"**super gem**" is an Aeroquip trademark. U.S. Patent Nos. 2,833,567 and 2,731,279

AMA-10

Also Available—Aeroquip's New Precision Tube Forming Catalog.

If you would like to have this, free, when we send you Catalog 103, please check box. ☐

Aeroquip Corporation, Jackson, Michigan
Please send me your new Catalog 103 on Aeroquip Hose Lines of TEFLON.

Name______________________
Title______________________
Company______________________
Address______________________
City______________ Zone________ State______________

Circle No. 120 on Reader Service Card.

but keeps top management advised on how they are doing."

A second, and to the fleet at least, a much more important aspect of the trials is what NATC calls "service suitability." "We may well find that an airplane complies with the requirements of the specs," a spokesman said "but as we push performance boundaries and altitudes on out, it may not be satisfactory for the job that it's intended to do even though it does comply with the specs. This goes way beyond the contract and becomes an inspection of the specs, but it is our duty to report what we find. On the other hand, we may find the airplane is satisfactory even if it doesn't meet specs.

"If we find the latter true, we again say so and don't try to clobber up the airplane just to meet some piece of paper."

He added that "what we really try to find here is this: Is the airplane capable of doing the job that the fleet needs to be done when it is operated by typical fleet personnel, maintained by fleet personnel?"

BIS gets its authority for conducting the tests from Navy regulations dating back as far as August 5, 1882. The regulations, as they now read:

"Trials and inspections shall be conducted by the Board of Inspection and Survey on all vessels and one or more aircraft of each type or model prior to final acceptance for navy service, to determine whether or not the contract and authorized changes thereto have been satisfactorily fulfilled.

"All material, performance and design defects and deficiencies found to exist, either during the trials or as a result of examination on completion thereof, shall be reported to the Board, together with its [NATC] opinion as to the responsibility for correction of defects and deficiencies."

There are 173 officers, 1,373 enlisted personnel and 692 civilians within NATC. Of the civilians, a great many are engineers and highly-skilled technicians. There are 65 electronic engineers in the electronic division, for instance.

Manufacturers are well represented, too. These companies maintain personnel at the test center: Chance Vought, Douglas, Grumman, Lockheed, Martin, McDonnell, North American, Curtiss-Wright, Temco, Hamilton Standard, Westinghouse, General Electric, Sikorsky and Pratt & Whitney. Others come to the base when there is an airplane or a piece of equipment in which they are particularly interested.

(Continued on page 69)

Who's Who at Patuxent

These are the officers currently in charge of evaluating all of Navy's new aircraft. Each is a graduate of the test pilot school at the Naval Air Test Center.

Commander, Rear Adm. Thurston B. Clark.

Coordinator, Capt. F. B. Gilkeson.

Director of Service Test, Capt. John R. Sweeney.

Director of Flight Test, Capt. R. M. Elder.

Director of Electronics Test, Capt. John L. Nielson.

Director of Armament Test, Capt. R. S. McElroy.

Director of Test Pilot School, Cmdr. W. H. Livingston.

Marine Corps Representative, Lt. Col. J. C. Richardson, Jr.

The Board of Inspection and Survey representative at NATC, to which evaluation reports are made, is Capt. Stratton R. Ours, Jr.


Clark


Gilkeson


Sweeney


Elder


Nielsen


McElroy


Livingston


Ours

Safety program relies on . . .

Education . . . to Keep Navy Pilots Alive

In the military services, aviation safety is a controllable variable—controllable to a certain degree, at least.

At the extreme, in wartime a military commander may order a pilot to fly an unsafe airplane through unsafe weather conditions to attack a heavily defended target; the pilot's chances of a safe return may be near zero. Under such circumstances the safety of the pilot and of the aircraft assume a secondary role; the primary object here is "get that target." The target may be worth far more than the cost of an aircraft, its destruction may save many more lives than that of the one pilot who destroyed it.

This is certainly the extreme concept of aviation safety, even in the military service. The far more prevalent concept, and the one under which the Navy operates in its day-to-day aviation, is "Safety First", the same concept practiced by commercial and private flyers.

• **Why safety**—Every first-line combat aircraft that is damaged or destroyed in aviation accidents is one that is not available to defend our shores. The fact that a replacement is somewhere along an assembly line is of little comfort to a task force commander, who needs a full, potent combat force at his disposal every moment. And it's of little comfort to the citizen, whose defense is spread thinner by every aircraft that is damaged or destroyed in aviation accidents.

• **Pilots are precious**—As for pilots, they are our most precious commodity. Even in combat the commander will consider the risk of a pilot's life far longer than the physical risk of an aircraft, or even several aircraft. And in peacetime the risk can only extend as far as the natural consequences of training. To become proficient in close air support of ground forces, low level delivery of special weapons, antisubmarine warfare techniques, and high altitude supersonic combat, risks must be taken and a certain element of danger to both aircraft and crews must be accepted. That amount of danger must be accepted in the same sense that we accept the known danger of crossing a busy thoroughfare, but we do it with our eyes open and with a look in both directions before striding out. So too, in naval aviation, the risk of life and aircraft is limited by all humanly possible means in the direction of safety.

• **Effective program**—The Navy has many good reasons, then, for insisting on an aggressive aviation safety program. The fact that it has been aggressive and purposeful is evidenced by the steady decline in the Navy's aircraft accident rate from 5.5 accidents per 10,000 flight hours in 1952 to 2.8 per 10,000 hours in 1958. This has been accomplished while placing many new high-performance aircraft into fleet operational use.

The Deputy Chief of Naval Operations (Air) is directly responsible to the Chief of Naval Operations for the direction of the Navy's program for the achievement of the highest practicable level of aviation safety.

Staff assistance for execution of this responsibility and coordination of aviation safety policies is provided by the Aviation Safety Division of the Chief of Naval Operations staff.

Through the medium of *Naval Aviation News,* a monthly magazine published for all flight personnel, Grampaw Pettibone, a contributing editor for the past twenty years, points up with barbed humor the error of their ways to safety delinquent pilots.

Key personnel within the staff of the Chief of Naval Operations, the Commandant, U.S. Marine Corps, the Bureau of Aeronautics, the Bureau of Medicine and Surgery, the Bureau of Naval Personnel, and the Naval Aviation Safety Center, meet at regular intervals to plan and coordinate the aviation safety efforts of the entire Navy as the CNO Aviation Safety Council.

The Navy's effort to reduce aircraft accidents is actively spearheaded by the Naval Aviation Safety Center at Norfolk, under the command of RAdm. Allen Smith, Jr. The Center maintains contact with all fleet and shore unit safety officers through various published media. It reaches the pilots and maintenance personnel directly through *Approach,* a monthly safety magazine whose star is "Anymouse," a personification of the anonymous report of a hazardous incident which readers are urged to submit. The Center monitors the Navy's aircraft accidents throughout the world and, through its voluminous statistics, is often able to detect a trend which can then be attacked before its consequences become even more serious.

The Center's specialists in aviation medicine and maintenance, and its class desks which are staffed by aviators experienced in all current models are a "filter center" which seeks new methods and techniques for improving safety of flight and disseminates them to the appropriate bureaus for consideration or to the fleet for adoption.

• **Human faults**—While new techniques and equipment do appear, the most common aircraft accident situation is still exemplified by the phrase, "there's nothing new in aviation safety," for basically, the accidents that occur today are caused by the same human faults that caused aviation's first accidents. Human beings, while engaged in flying or working on aircraft, are subject to lapse of memory, gaps in training, physical or mental fatigue, and to situations brought about by material or design failures over which they have little or no control.

Safety then, in naval aviation, is a matter of education, constant education. Through various media such as magazines, posters, and lectures by Aviation Safety Officers, aviation personnel are constantly reminded that safety is not practiced for safety's sake alone, not for a commendation or an award, but for the positive purpose of achieving and maintaining a state of readiness which will enable naval aviation to function to its fullest capability in time of national emergency. The fact that dollars are saved is important, for every barrel has its bottom, but the dollar saving is once again important primarily in its reflection upon national defense—the million-dollar accident averted today is a million-dollar aircraft that need not be bought with next year's fiscal funds.

Our national security rests on many complex forces, some military and some not. One of the military instruments of course is an adequate and ready naval air force. But the total strength and effectiveness of that force "when and if the bell rings" is dependent in a large measure on the impact of accident attrition. Conservation of our aviation forces today, through effective education, development of safer procedures, and improvement in equipment design and reliability, may well assure vital availability tomorrow of our naval striking force as an integrated tool of defense.

ASW—An Ex

Submarines are now a major menace to the United States, in the Navy's book. At the latest count Russia has more than 500, and to make a bad matter worse, it's assumed that soon the Soviet will have atomic powered submarines capable of carrying guided missiles of the Polaris type.

This means that antisubmarine warfare weapons have a top priority for the defense of the United States. And high on the Navy's list is the newest land-based turboprop, P3V-1, Electra which is ultimately to replace its older sister, the P2V-Neptune.

Like the Neptune, the plane was designed and built by Lockheed Aircraft. Electra got the Navy's blessing last

P3V-1 Data

Weights and Structural Data

Design Takeoff Weight	125,500 lbs.
Maximum Landing Weight	125,500 lbs.
Normal Landing Weight	69,000 lbs.
Wing Loading (at 101,500 lbs.)	77.5 lbs. / sq. ft.
Power Loading (at 101,500 lbs.)	6.2 lbs. / eshp

Dimensions and Areas

Height	33 ft.
Length	104 ft. 6 in.
Wing Span	99 ft.
Wing Area	1,300 sq. ft.
Aspect Ratio	7.5
Horizontal Tail Span	42 ft. 10 in.
Fuselage—Outside Diameter	136 in.
Fuselage—Inside Diameter	128 in.
Landing Gear—Tread	31 ft. 2 in.

Ex[illegible]ing Role for Naval Aviation

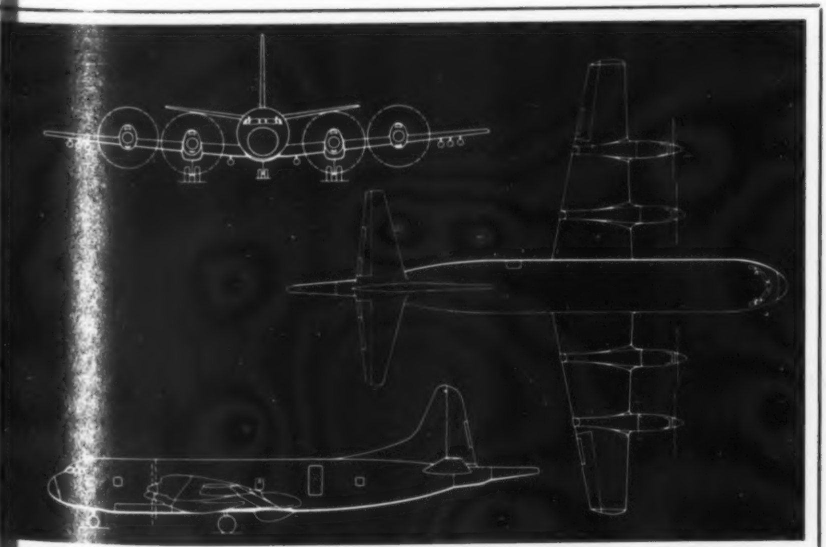
April following a competition for an "off-the-shelf" ASW aircraft.

So far two contracts have been awarded. The first for $1.98 million covered a mockup model and an outfitting study. The second amounting to about $10.5 million was for pre-production engineering and master tooling. An aerodynamic prototype of the plane (shown above) has been flying since August 29, 1958.

The plane will carry a crew of 10. Fuselage will include a plastic tail stinger housing a "Magnetic Air Detection Unit," which seeks out submerged metallic objects by noting deviations in normal magnetic fields.

Factors which the Navy considered important in the decision to buy the P3V-1 include:

- Early availability for fleet use because of work already done in the development of the commercial version of the Electra and the still earlier C-130 Hercules which results in a plane which is pretty well "debugged" and pretested.
- An estimated service life of about 15 years with plenty of room for product improvement.
- Capability of speeds in excess of 460 mph and as low as 170 mph and altitudes in excess of 30,000 feet or as low as the wave-tops.



In one of the flattest diamonds flown by any aerobatic team are . . .

The Blue Angels—The Navy's Showcase

By George Hart
Technical Editor

PENSACOLA, FLA.—With a shriek of "IT'S COME APART," a woman watching the Navy's Blue Angels at work collapsed in a dead faint. Actually, what she believed to be one aircraft coming apart was the tightly meshed formation entering the striking "Fleur de lis." The break, followed by incredibly rapid rolls, convinced her that catastrophe had overtaken the show.

Led by Cdr. E. B. (Ed) Holley, the Blues hold their Grumman F11F-1 Tigers in about the tightest formation of any demonstration team flying today. In a diamond, Capt. Stoney Mayock, Marine Corps representative on the otherwise Navy team, and Lt. H. P. (Herb) Hunter, flying Nos. 1 and 2 respectively, keep their cockpit canopies almost level with, and about three feet away from, Holley's wing tips. Lt. R. L. (Bob) Rasmussen, flying No. 4 in the "slot," puts his canopy between Nos. 2 and 3 wing tips. The resulting evenly spaced, flat diamond means that Rasmussen's head is only about six feet below the level of Holley's. In rough weather, the formation is spread to put about five feet between aircraft.

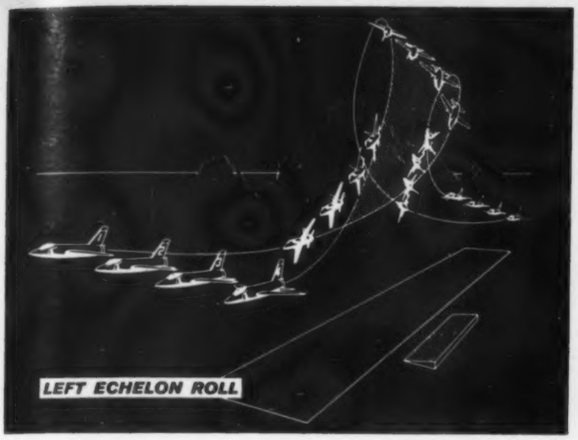
Even taxiing, the Blues hold a tight formation, and their 19½-min. show (it rarely varies by more than half a minute) is an action-packed demonstration of skill and perfect teamwork. By employing two solo planes, flown by Lt. Jack Dewenter, the solo leader, and Lt. John Damian, to fill in while the formation is positioning between maneuvers, the hand-picked team holds the spectators' attention without a break.

Between them, the solo pilots and the formation make 23 passes in front of the spectators. This calls for a fine sense of timing, because there are only split seconds to spare between each pass.

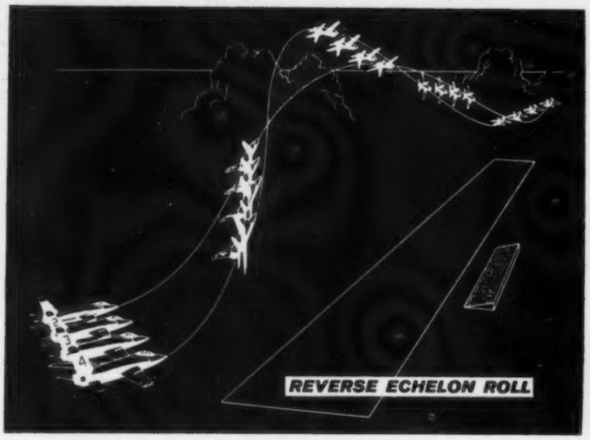
The **"Opener"** probably is the most demanding in this respect. The solo planes, coming in from opposite directions, must meet before the stands and pull up in a series of vertical rolls before the other four converge. The latter, rolling on their backs at 7,500 ft., streak down at closing speeds to 1,200 mph. Holley and Rasmussen cross over Mayock and Hunter with about 15 ft. to spare.

By letting oil from special tanks burn in the jet exhausts of the 10,500-lbs. thrust, afterburning J65-W-18 engines, the Blues create smoke trails. In some maneuvers, they jettison red and blue dye from the wing tanks to create colorful streamers. This sort of thing delights the spectators; however, the pilots welcome the effect as an aid to spotting each other and judging distances.

• **Holley the leader**—But the success of the show depends primarily on Holley. His hardest job, he feels, is estimating cut-off angle after one pass, and speed at the top of a climb before dropping the nose of his aircraft into position for the next. The formation is committed at this point and, if the unseen "reversal" isn't done just right,



LEFT ECHELON ROLL



REVERSE ECHELON ROLL

the ensuing maneuver could almost go unseen too, he quips.

The leader must know just what problems the others are faced with—the formation as well as the solo pilots—and gauge his actions accordingly. Throughout all his maneuvers, he holds a positive G force. Any negative G condition tends to start the team porpoising. This could get amplified back through the formation, particularly when flying trail or echelon. To help here, the pilots simulate positive stick force by flying with as much as full forward elevator trim. They also have to trim to overcome "proximity effect," the pressure exerted on one fast-moving plane by the cushion of air surrounding the next.

Seen at close range in the air, the Blues are working an awful lot harder than is apparent to those on the ground. The planes are bucking around almost all the time, but the pilots' virtually intuitive corrective action prevents their shifting position by more than about six inches. Each pilot plants his forearm firmly on his knee to assist in controlling the stick. Speed brakes constantly are popping out and in, and radical changes in power setting often are required on short notice. Acceleration forces peak at better than 6 Gs.

The **Diamond Roll** is one of the more straightforward maneuvers in the Blues' repertoire, but it's one of the most graceful of all. As with most of the formation aerobatics, Mayock, Hunter and Rasmussen don't consciously go through the mechanics of accomplishing a roll or a loop. Rather, they are concentrating on following Holley and keeping their formation. Being out in front, Holley is very much aware of what he's doing in the cockpit. He not only has to judge the rate and path of each maneuver carefully so that the others can stay with him, but he has to make sure his timing will get the job done as they fly along the viewing line.

The Blues believe they are the only team in existence to perform a **Left Echelon Roll.** This means tossing the book aside, because it's just not done to turn into an echelon—let alone roll into it. The success of this exacting maneuver is largely up to Mayock. He holds steady while Holley starts the roll and, when he sees the lip of the inlet duct and the outside canopy rail of the lead ship are aligned, he starts to roll too.

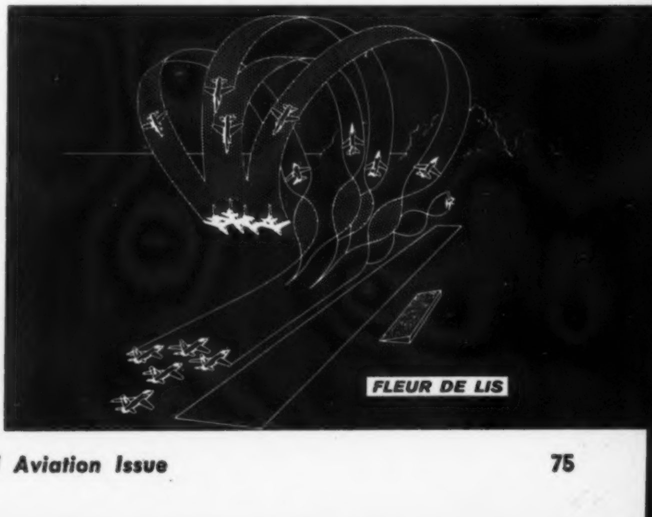
The others follow Mayock, and keep formation by lining up helmets. The result is a kind of bowed echelon and, if Mayock didn't set it up just right, it could be a really sloppy formation. Holley and Mayock reduce power steadily until they are inverted, and then add it slowly. Hunter and Rasmussen, particularly the latter, are adding more and more power as they swing around their wider arcs.

The **Reverse Echelon Roll** is a little less complicated, because Holley is rolling away from the formation. Power isn't so much of a problem either, because the formation does not describe such a wide arc. But Mayock again has to set things up right. He must slide across smoothly from right echelon to trail to left echelon as the roll progresses, and the other pilots keep him aligned with Holley.

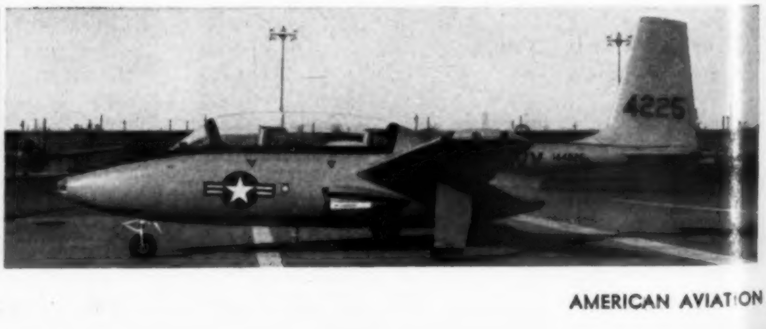
To do the job right, Mayock has selected all sorts of reference points for himself. They vary from the arresting gear hook and a protruding antenna to nuts, bolts, ducts and access doors on the lead plane.

The **"Three-in-One,"** or "Granny Knot" as the Blues call it, is a good workout for Holley's sense of timing and positioning—and another example of teamwork in setting up the all-important launching of a maneuver. Approaching in echelon, Holley calls for a diamond. Rasmussen cues Holley when the diamond is made and, heading up, Holley calls for afterburners. Hunter, sighting on the horizon beyond

THREE-IN-ONE



FLEUR DE LIS


4225

the lead plane, tells the formation when it is vertical. Then Holley calls for a 90° roll. Rasmussen, for some reason which he can't explain, has the knack of judging just when the formation has rolled enough, and clues Holley accordingly.

Now, Holley pulls on over in the first loop. The whole chain of staccato commands and appropriate action takes mere moments, and ends with the formation upside down directly over the viewing line.

Everyone helps call the shots in the **"Fleur de lis."** Leading the diamond in, Holley calls: "Break . . . now" in front of the grandstand. Rasmussen watches Mayock and Hunter cut sharply away at 45° and, as soon as he sees they have clearance, snaps: "Roll." They all roll once, and then haul back into a loop, fanning out until they get on their backs. Mayock lines up on Hunter who, judging his required position on Holley, calls "Float it" or "Pull it" to slacken or tighten the loop as necessary.

• Tiger at the tail—Meanwhile, Rasmussen, taking the inevitable long way round, gives the engine everything it's got to keep his position properly. When he sees everyone is ready, he calls: "Let's get him," and they close in on Holley to form a tight diamond again as they come down and past the spectators. Powerwise, the "slot" aircraft needs to have the edge on the others. All engines have a thrust tolerance, and test stand records are studied so that this plane can be equipped with a high-thrust engine.

The solo pilots' high-speed aerobatics call for an equal amount of precision, and this is particularly true of their inverted passes. Actually, their Knife Edge, when they sweep in from opposite directions on their sides, and their inverted work, is done in a slight arc. They pull up a little before rolling and starting their pass.

In one maneuver, Damian climbs inverted after an inverted pass. When he first started practicing this, he says, he had a tendency to let the nose drop a bit before he was ready to climb up, and he never did get to the climb under these circumstances. He had to roll right side up hurriedly to avoid hitting the ground.

No discussion of the Blue Angels would be complete without mention of Lt. Jack Reavis, the Maintenance Officer, Lt. Mark Perrault, the Public Information Officer, and the men who look after the aircraft.

Reavis flies the Douglas R5D which is assigned to the team to carry the men and equipment. Although they are almost continually on the road during the February to November show season, they keep the planes in top condition. The Blues have never lost a show for maintenance reasons, yet they carry only the more commonly used spare parts with them. Incidentally, the part replaced most often is the top section of Rasmussen's fin. It keeps getting burned by Holley's exhaust.

Perrault probably is one of the most unusual PIOs in the world. Normally, he flies the two-seat Grumman F9F-8T Cougar, which, among other things, is used to give jet orientation rides to news media representatives. He narrates the show and is uniquely qualified to do so. For, though he never flies before the spectators, he often fills in during the Blues' never-ending practice sessions. If a member of the formation is off duty for some reason or other, Perrault straps himself into an F11F and makes up the diamond—right in there with the others.

The Blue Angels were formed to "demonstate precision techniques of naval aviation to naval personnel and, if directed, to the public." They hope, in addition, to attract would-be aviators to the Navy. They accomplish their mission most successfully.

HELICOPTER FLOATS / another product of Air Cruisers research

Sea Legs for "Whirlybirds"

A helicopter can land far out at sea or high on rugged mountain peaks in complete safety with the remarkable Air Cruiser floats. "Whirlybirds" become amphibious in a matter of seconds with these dual purpose floats which keep them dry on water and level on rough terrain.

Typical floats are the type shown above which normally are stowed around the landing gear and inflate in as little as six seconds for emergency landings. Safe, lightweight and simple to inflate, Air Cruiser floats can be custom made to meet specific requirements.

Whether their requirements for flotation gear are simple or extremely exacting, helicopter manufacturers rely upon Air Cruisers' engineering competence and long experience as the pioneer developer of floats of all types for helicopters.

The only manufacturer which conducts continuous research in survival equipment, Air Cruisers is America's most experienced fabricator of inflatables from rubberized nylon materials. Your inquiries are invited.

THE GARRETT CORPORATION

AIR CRUISERS DIVISION

BELMAR, NEW JERSEY

LIFE JACKETS • LIFE RAFTS • HELICOPTER FLOATS • ESCAPE SLIDES • GAS BREATHER BAGS • DECELERATION BAGS

Circle No. 128 on Reader Service Card.

In this issue, the U.S. Navy's current air potential has been outlined and discussed. But what of the future of naval airpower? When the Polaris missile goes operational, will the carriers be phased out automatically? What kind of new aircraft does the Navy feel it needs to carry out its role?

To get the answer to these questions and others, American Aviation's Defense Editor, Betty Oswald, interviewed Admiral Arleigh Burke, Chief of Naval Operations, in his Pentagon offices. Reported below is Editor Oswald's summary of the Admiral's replies.

The Future of U. S. Naval Aviation

Naval carrier aircraft will be a major factor in the defense of the United States for the foreseeable future. Events of the last few years have demonstrated the soundness of the thesis on which the U.S. has built up its naval airpower.

Perhaps, the picture would come clearer if we remembered that the purpose of war is to control people and territory rather than devastation and ruin. As a result, weapons, tactics and equipment are used to obtain the needed control. Under some conditions, use of big weapons is essential, while in other cases, lesser weapons will do the job.

Carrier air can handle both the big and the small job. In meeting day to day situations such as those in Jordan, Lebanon and, earlier, in Thailand, Suez and Viet Nam, it was possible to produce terrific power with but a couple of carriers. Aircraft could be put where it was needed and held there under the control of the U.S. It was not necessary to ask permission of any foreign power nor to accept the conditions which might have been imposed on the use of aircraft from land bases.

These recent situations established, in my opinion, the absolute need for manned aircraft armed with conventional weapons and with a nuclear capability. The knowledge of the pilot is also essential to handle the day-to-day situations which are becoming almost a way of life. While sometime in the future, there may be a substitute for the reconnaissance capability of the manned aircraft, that day hasn't yet arrived. In any event, information that can be called back by a pilot or crew puts commanders in a position to deal with emergency situations quickly.

Not even a Polaris-equipped submarine can be a substitute for carrier air. Its value exists solely in the event of a major war. It constitutes no cure for uncertain situations nor for the protection of merchant ships at sea.

Carrier air provides the power you need when and where you need it. It will continue to be used in general wars and will have real value particularly in the early days when enemy ships and aircraft would not only have to seek out the carrier but attack it. And the carrier has a good defense system.

In the meantime, other carriers not immediately engaged would come in. Remember that almost all of the trouble spots of world are within range of naval aircraft.

Aircraft will, of course, change radically in the years ahead to meet new conditions. As of now the Navy is studying and has on the drawing board:

- Fairly low-performance aircraft of the workhorse variety which would be coupled with good high performance missiles to take care of either the day-to-day emergency, or the local war.
- Very cheap, single-purpose aircraft. These would be used to do a single job and do it well. However, we aren't doing very well in this category because everything costs so much now.
- Very high performance aircraft. Here the trouble is that the aircraft are almost missiles in their performance characteristics and require almost automatic equipment. However, they have the advantage of having a man aboard with man's judgment to boost the capability of the automatic equipment, to come back when called and to apply only the degree of force which may be needed.

The Navy is still very much interested in the SeaMaster. It is a good mine-layer. It is also capable of delivering either conventional or nuclear weapons. It fills in the cracks in the defense structure since it is able to search out a target and then attack. It can, of course, operate almost independently with only a tender to service it.

How many will be purchased will depend to a large extent on the final cost of the aircraft and the performance characteristics which show up when the test program is completed.

In the case of the nuclear-powered aircraft, the Navy is definitely interested. We want to go slowly and cautiously because we believe that in the long run this approach will pay out. Some answers may be available late this fall.

As matters stand now, the most difficult problem we face is the need to attain balance—a proper percentage devoted to ready forces, with the rest available for the weapons of the future.

Carrier aircraft by its versatility provides one kind of balance. It gives us the power, either physical or psychological which can be used to control day-to-day crises. It gives us, at the same time, the power needed to handle limited war and it will pack a tremendous wallop in the event of a big war.

HAWKER SEA HAWKS fly over the 46,000-ton Ark Royal—one of only six carriers in Britain's Fleet Air Arm.

Britain's Fleet Air Arm:

Interservice Hostility Slows Progress

By Anthony Vandyk
International Editor

The Fleet Air Arm, the aviation branch of the Royal Navy, can be very adequately described by a sentence written in the last century by Lord Nelson: "We are few, but we are the right sort."

The Fleet Air Arm has long been accustomed to operating on a shoestring budget. Even today, when it represents the Royal Navy's primary defensive and offensive power, it remains a small force with a mere half dozen carriers for its aircraft.

The Fleet Air Arm is unique among naval air forces in that it has no land based combat aircraft. Under the British setup patrol bombers are operated by the Royal Air Force's Coastal Command. Liaison between the RAF and the Fleet Air Arm is good but nevertheless there is not the close association that would exist if the patrol bombers were part of the Royal Navy.

The RAF traditionally has had a part in naval aviation, a fact that many British naval men find hard to understand. The Fleet Air Arm between World Wars I and II was officered in part by the Royal Navy and in part by the RAF but almost all the noncommissioned personnel were from the RAF. It was only in 1937 that the British government decided that the Fleet Air Arm should comprise exclusively naval personnel.

The latent but friendly hostility between the Royal Navy and the RAF in aviation matters continues. It has proven very difficult to get either service to compromise in its specifications for aircraft so that the same model can be ordered for both services. More than once the British government, using shotgun tactics, has usually had to step in —to the Fleet Air Arm's disadvantage.

The De Havilland Sea Venom is an example of an aircraft which the Royal Navy had to accept. Basically an adaptation of the RAF's Venom all-weather fighter, it was not designed for carrier use. However, thanks to the ingenuity of De Havilland's design department and to the Fleet Air Arm's ability to get the best out of any aircraft, the Sea Venom worked out reasonably well. The Sea Venom is now being replaced by another De Havilland model, the Sea Vixen, while the Royal Navy's other interceptor, the Hawker Sea Hawk, is also on its way out with the Vickers Scimitar coming in as its replacement. These two new models have been much delayed in entering combat service with the Fleet Air Arm and, being transonic (about Mach .85), cannot compare with the much faster fighters in service with the U.S. Navy. There is no question that the Royal Navy badly needs a supersonic fighter but it has none and there are no firm plans for it to acquire any.

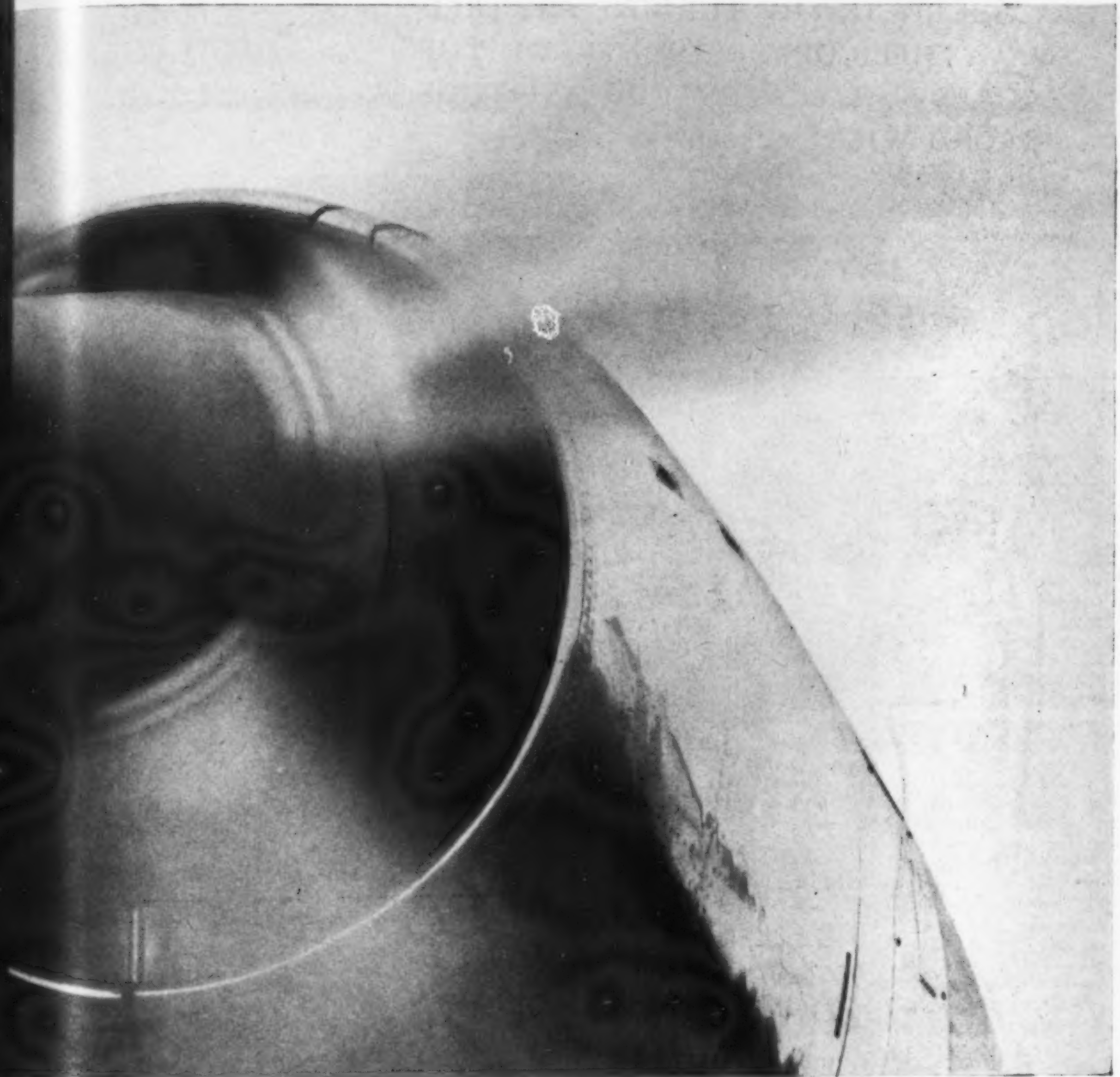
The Saunders-Roe SR 177 jet-plus-rocket fighter was designed to a naval specification as a supersonic interceptor but the aircraft was not ordered into production, the Royal Navy apparently deciding that it would use its procurement funds instead on the Blackburn NA 39 twin-engine low-level attack aircraft. Thus for defense against high-speed attackers the Fleet Air Arm has no adequate aircraft in service or on order.

The real strength of the British naval air arm is in its antisubmarine units. This is logical since the Royal Navy's policy is that the prime mission of the Fleet Air Arm is antisubmarine warfare. The turboprop-powered Fairey Gannet and the Westland license-built S-55 helicopter are the brunt of the Royal Navy's airborne ASW force.

The Wessex, British version of the S-58, will soon be supplied to the Fleet Air Arm. This rotorcraft is powered by the Napier Gazelle turbine. Later the Royal Navy plans to bring into service the twin-rotor Bristol 192 turbine helicopter.

Apart from a few Hillers, the Royal Navy's entire helicopter force is Sikorsky-designed and Westland-built, comprising S-51s and S-55s. U.S. design also predominates among the Royal Navy's early-warning radar aircraft. The Douglas Skyraider is the only operational aircraft in this category in the Fleet Air Arm although an early-warning version of the Fairey Gannet is under development.

For its attack missions the Royal Navy recently ordered the Blackburn NA 39 which was developed with funds from the U.S. Mutual Weapons Development Program. This promising twin-engine (De Havilland Gyron Junior) aircraft made its first public appearance at this year's Farnborough show but is several years away from entering combat service. During the intervening period the Royal Navy will continue to rely on the turboprop-powered Westland Wyvern.



FOUGA CM 175 M JET TRAINER is in flying prototype stage and is well tested. Production line of 30 now in progress.

French Naval Aviation Gets a New Look

A new generation of naval aircraft has been produced by French industry to cope with tasks and missions of France's reborn air arm.

Reborn during and at the end of World War II, essentially with the support of the U.S. Navy, the Aéronautique Navale (Air Arm of the French Navy) presently operates more than 1,000 aircraft and has a strength of about 11,000 (including 800 officers). These men and aircraft are distributed between the Naval Base in metropolitan and overseas French territories and the three aircraft carriers operated by the French Navy: the "Arromanches" (ex. U.K.), the "La Fayette" (bought from the U.S.) and the "Bois-Belleau" (on loan from the U.S.).

Main NATO missions of the Aéronautique Navale are antisubmarine warfare and protection of convoys. However, for the time being, the Aéronautique Navale is heavily committed to pacification duties in Algeria. These include coastal survey, fighter-bomber support for the ground forces, assault transport with helicopters.

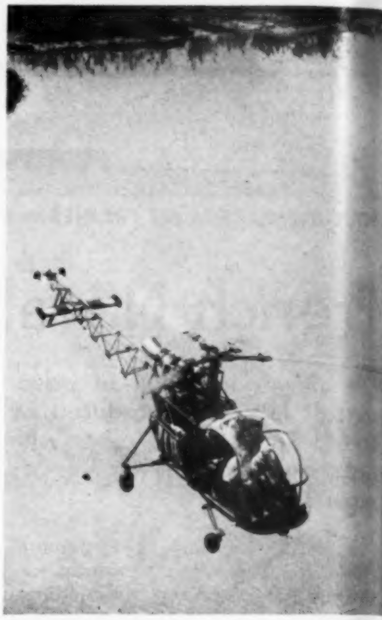
The well-balanced forces of the Aéronautique Navale are, however, fit for a wide range of missions of defense or attack on ground or naval targets, and

(*Continued on page* 86)

Aéronautique Navale Replacement Plans

TYPES	PRESENTLY IN USE	ON ORDER
Interception	Sud-Aviation "Aquilon" French development of the "Sea Venom"	No replacement planned at present.
Assault	F 4-U 7 and AU-1	Dassault "Etendard IV M". One prototype flying. A pre-production line of five now being built.
ASW	T B M	Breguet 1050 "Alizé". Pre-production line aircraft now well tested. Production-line of 75—Breguet plant Toulouse—: deliveries beginning February 1959.
	"Neptune"	Replacement in four/five years by NATO Patrol Aircraft.
Helicopters	HUP HSS "Alouette" (20 in use)	Deliveries of Sud-Aviation "Alouette" in progress. Prototype of SE 3200 medium helicopter now built by Sud-Aviation, a three turbine helicopter for ASW and transport purposes.
Transport and liaison	SO 30 "Bretagne" SO 94/95 "Corse" MD 315 Nord 1100	A small batch of Morane-Saulnier "Paris" four-seater liaison jet aircraft on order. First deliveries imminent.
Trainers	MS 733 SNJ "Hellcat" "Vampire"	Fouga CM 175 M. Prototypes flying and well tested. Production-line of 30 now in progress. Naval version of Fouga 170 "Magister" trainer used or on order by the French, Belgian, German, Israëlian air forces.
Miscellaneous	Sunderland seaplanes. Lancaster (contribution to SAR missions).	Presently replaced by Martin/Marlin.

BREGUET 1050 ALIZE, powered by Rolls-Royce Dart, is an anti-submarine aircraft due for delivery in February, 1959. Dassault Etendard IV M fighter (lower right) is now flying in prototype. ↓



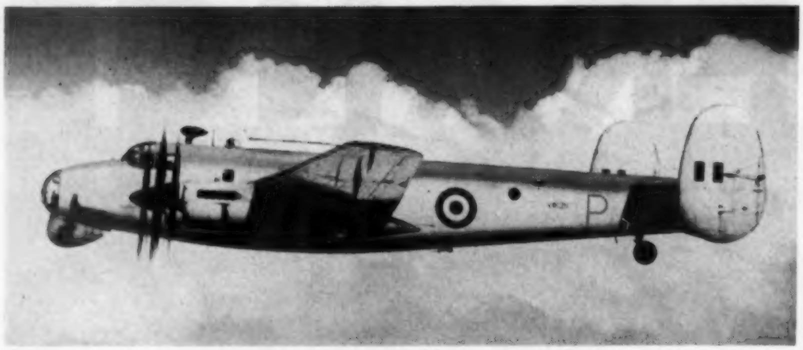
SUD AVIATION'S turbine - powered Alouette II is now being delivered.

also of mine-detection, transport and training.

Besides its own two shops at Cuers and Lartigue, the Aéronautique Navale largely uses the facilities of the French aircraft industry for the maintenance and overhaul of its aircraft.

Based on massive continental territories and operating small-sized aircraft carriers (two 27,000 tons "Clemenceau" type aircraft carriers now being built and a third planned as well as an helicopter carrier), the Aéronautique Navale has been led to develop a new generation of naval aircraft. These are presently produced to cope with its genuine missions. The accompanying chart shows how these aircraft will replace those presently in use. There are good reasons to beleve that these types fit the needs of several navies whose duties are comparable. This applies, especially, to the Breguet 1050 "Alizé" ASW aircraft, to the Dassault "Etendard IV M", naval assault aircraft and to the Fouga CM 175 M trainer. It is also hoped that the SE 3200 helicopter, now being built to replace the HSS 1 and which will be one of the main novelties of the next Display, at Le Bourget, in June 1959, will, like the "Alouette" of Sud-Aviation, attract wide international attention.

Under sponsorship of the French Navy, several types of antiaircraft and ship-to-ship missiles are now being developed in cooperation with the Naval Arsenal of Ruelle and Latecoere. Tested at the Ile du Levant range of the Navy none of these missiles has yet reached the operational stage.



Patrol bomber to replace the Avro Shackleton and the . . .

Lockheed P2V is the aim of the . . .

NATO Competition

European makers form strong joint ventures

Unprecedented cooperation between European aircraft manufacturers is taking place in connection with the NATO patrol bomber competition. The NATO specification calls for a long-range aircraft with a capacious fuselage to replace the Lockheed P2V Neptune and Avro Shackleton currently used.

Although there is no reason why the winning aircraft should not be a U.S. design, all indications are that a European project will be chosen. However, Lockheed, Douglas and Convair are known to have studied the NATO specification at some length. The possibility of adapting the Electra to meet the specification is believed to have been considered by Lockheed. Douglas is understood to have made some studies on a patrol bomber derivative of the DC-7C fitted with Eland turboprop engines.

The European projects are all entirely new designs. Perhaps the most ambitious is one designed by five manufacturers belonging to four countries. This is a joint project by A. V. Roe (U.K.), Fokker (Netherlands), Dornier (Germany) and two French companies—Breguet and Sud Aviation. It reportedly calls for Rolls-Royce Tynes. Another team in the competition is reportedly made of two British companies—Bristol and Short Bros. & Harland and a continental European associate. Nord-Aviation and Dassault, both French companies, have also submitted projects. Piaggio of Italy has also entered a design, reportedly a flying-boat.

AIRTRENDS

Airlines with recently-awarded new routes to Florida are making plans to start service about Dec. 1. Northwest will offer extra-fare de luxe service with Stratocruisers, will operate regular first-class with DC-7s and coach with DC-6s. Capital will fly Viscounts first-class, Constellations coach. Capital is dickering with Continental for lease of three larger, faster Viscount IIs for Florida route. TWA will start with Super-G Connies. Service will include Miami-Los Angeles and Miami-San Francisco onestops (St. Louis).

Talks in Denver recently between Continental Air Lines and Aeronaves de Mexico are said to have concerned the Mexican line's interest in two CAL DC-6Bs. Aeronaves operates Convairs on Mexico City-Juarez route, needs more capacity. Top Aeronaves officials were accompanied to Denver by former New York Mayor William O'Dwyer, who represents CAL in Mexico. The fact that conversations were top-level and that CAL and Aeronaves connect at El Paso-Juarez led to rumors of interchange, but CAL claims there's nothing definite.

Viscount operating costs are less than original estimates made four years ago, Capital Airlines says. On a cost per total aircraft hour flown basis, estimate made in May, 1954 was $369.35. Actual figure for first half of 1958 was $358.53. Estimate of cost per revenue aircraft mile flown was $1.545, actual $1.453. All cost estimates have proven to be very accurate, except direct maintenance, which is substantially lower. Cost of Dart engine overhaul materials is much less than originally anticipated due to extended life between overhauls that has been attained, Capital states.

Substantial airfreight growth continues. So far, shipments are 3% ahead of same 1957 period. Percentage gain looks low, but 1957 freight figures were greatly inflated because of three-month (May-July) Railway Express Agency strike. Totals at yearend are expected to be considerably above 1957. Cargo officials say present load factors on all-freight planes are so high now that carriers may run into trouble handling December rush.

Predictions that cutrate competition on South American routes might force a return to subsidy (A/A, Aug. 11) have come true. Panagra asked CAB for subsidy (see page 94) and it's not unlikely that others could follow, as non-IATA carriers continue to drain away traffic.

Pan American officials point to possibility that Boeing 707 may have to make a refueling stop on eastbound (as well as westbound) transatlantic flights because of operating limitations imposed by Port of New York Authority at New York International Airport (see page 96). Runway restrictions and 1,200-ft. minimum altitude over communities may result in lightened fuel loads.

The burden of proof changed hands swiftly at deadline in the complex Pan American/National Airlines' equipment lease and stock exchange agreement (AA, Sept. 22, p. 58) as CAB scheduled oral argument October 20.

In its first hint as to action on the Pan American/NAL agreement, the board ordered opposing carriers (Northeast, Eastern and Delta) to show cause why it should not approve the short-term lease. But on the long-term lease and stock exchange, it ordered Pan American and National to show cause why it should not restrain them from action until it completes its investigation.

Growing tension between the airlines and pilots was reflected in the heated rejection of ATA's charge of "imbalance" by ALPA's Sayen. It took the pilots union president less than 24 hours to blast ATA president Stewart Tipton's charges that the airlines are kept on a "constant merry-go-round" by the union as being "misleading" and "inaccurate." As the airlines tend toward bargaining on an industry-wide basis and the pilots remain adamant in their demands, fiery charges and counter-charges can be expected before settlement.

AIRTRENDS

Bets are that Civil Aeronautics Administrator James T. Pyle will be named deputy administrator of the Federal Aviation Agency now that Special Presidential Assistant for Aviation E. R. (Pete) Quesada has been appointed head of the new agency. Organization of the FAA and transfer of the functions and activities of the CAA, the Airways Modernization Board, and other government aviation agencies to be incorporated within the FAA, as provided by law, will be completed by December 31, 1958.

Pressure for early re-enactment of the vetoed federal-aid-to-airports bill will be applied by Democratic leaders in Congress. Target date is February 1, 1959. Bill would extend the Federal Airport Act another five years and increase federal participation from $63 million to $100 million annually, plus making an additional $75 million in federal funds immediately available for jet airports.

Revised standards for the design of runways to meet the requirements of both conventional and turbine-powered commercial transports have been placed in effect by the Civil Aeronautics Administration. The new standards are contained in CAA Technical Standard Order N6b, "Runway Strength and Dimensional Standards for Air Carrier Operations," and supersede TSO-N6a dated October 4, 1948.

Under the revised criteria, the number of airport classifications for air carrier service has been reduced from six to four with corresponding changes in runway lengths, widths and strength.

The new categories of runways with the revised maximum runway lengths, including a correction for temperature, are: Local, 4,200 feet; Trunk, 6,000 feet; Continental, 7,500 feet; Intercontinental, 10,500 feet. Runway widths have been standardized at 150 feet except in the Local category which is 100 feet. Under the old TSO, runway widths for the larger category airports was 200 feet. Correction for elevation and gradient remains unchanged.

New is the inclusion of a clearway concept in TSO-N6b. Based on the clearway principle as described in Special Civil Air Regulation SR-422A issued by the Civil Aeronautics Board, it makes possible a reduction in paved runway lengths from those set forth in the TSO, where it can be shown economies will result without sacrificing safety of operations.

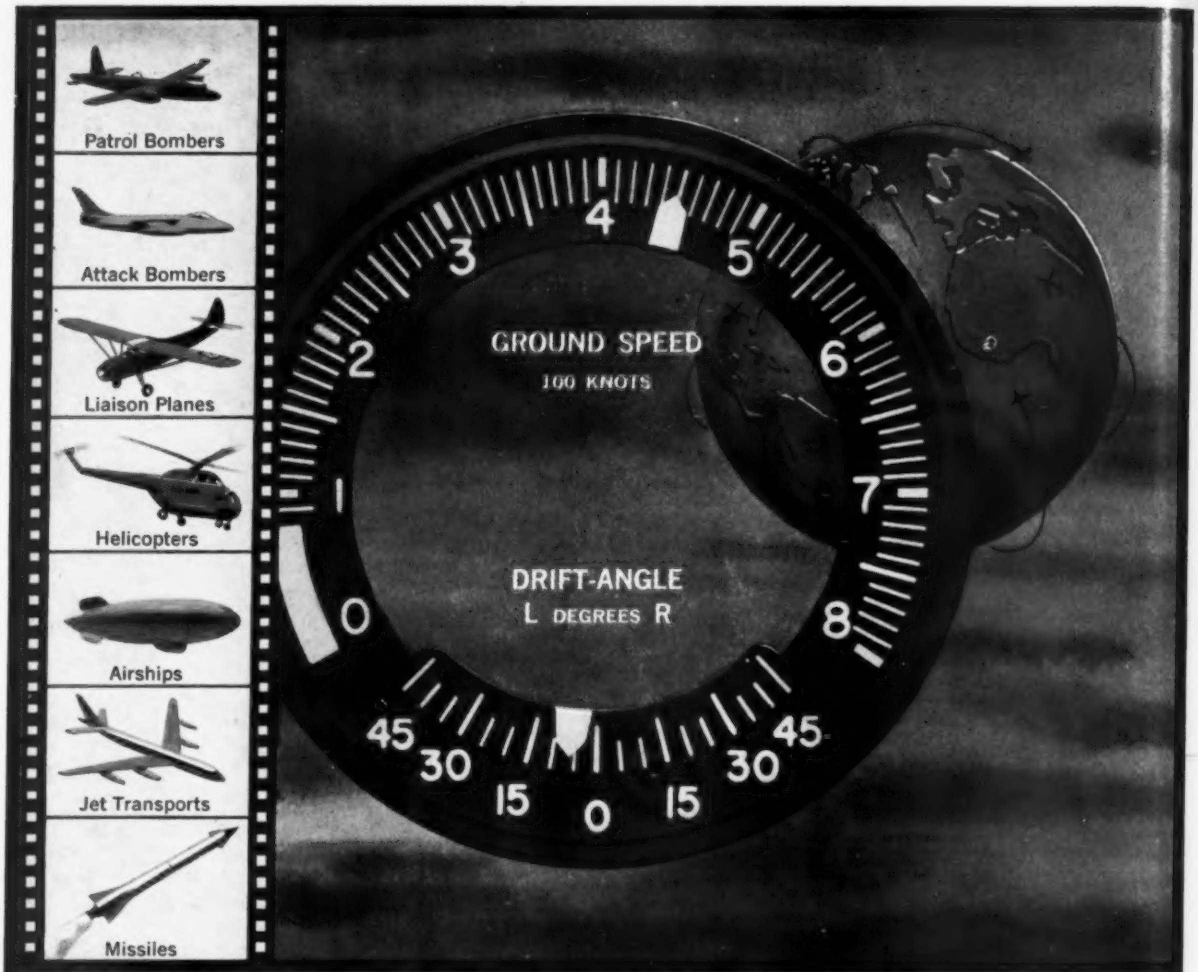
The TSO is intended to indicate to project sponsors the maximum limit of runway construction to which federal-airport-aid funds will be applied and to aircraft manufacturers and air carrier operators the maximum effective airport runways which normally will be available for present and future aircraft.

Need for a stronger and more effective voice in aviation policy/rule making councils is being recognized by associations outside the airline and aircraft manufacturing industries, generally conceded models of organized strength. National Business Aircraft Association at its recent convention authorized doubling its Washington headquarters and staff; Airport Operators Council plans to triple its current operating budget and administrative staff concomitant with an expansion of its membership base, and American Association of Airport Executives is seriously considering establishment of a headquarters office with Washington a likely site.

The hike in airport liability insurance rates is due mainly to uncertainties inherent in initial commercial jet operations. Insurance companies reportedly want to build up reserves against added contingencies arising from increased traffic and increased number of visitors at airports which jets are expected to bring; higher value of jet aircraft, and general expansion of airport facilities to accommodate jet traffic.

Port of New York Authority's concern over the jet noise problem has won kudos within at least one branch of the aviation fraternity. Even airports professing "no noise problem" as well as others which remained noncommittal generally credit PNYA with performing a service to the industry by its successful effort in getting jet noise reduced to a more tolerable level than, would have been done otherwise.

FROM AN ORIGINAL PAINTING FOR CECO BY R. T. HANDVILLE



WHY RYAN CONTINUOUS WAVE RADAR IS BEST FOR DOPPLER NAVIGATION

Through its pioneering work with the Navy and Army, Ryan has demonstrated that continuous wave radar is the best Doppler navigation system for every military and commercial application.

Ryan RANAV* systems are the only CW Doppler navigators in production. They have major advantages for aircraft navigation, ground speed measurement, missile guidance, and helicopter hovering. For example, RANAV is:

LIGHTEST – Ryan Doppler navigators are lightest, saving many precious pounds of weight, because CW radar requires less power for comparable performance and eliminates the need for many components required by pulse radars. RANAV also features a unique lightweight *non-gimballing* antenna system.

SIMPLEST – RANAV requires no IF (intermediate frequency) amplifiers or automatic frequency control circuits. Only one microwave generator is used and the systems have less tubes and components.

MOST COMPACT – Inherent simplicity of CW radar systems plus the ingenuity of RANAV design has enabled Ryan to take most advantage of subminiaturization and transistorization, creating compact systems with advanced modular units and etched circuitry.

MOST RELIABLE – RANAV continuous wave automatic navigators are most reliable because they are simple, rugged, and completely transistorized. RANAV also uses a long-life transmitter and it features a foolproof, non-wiggly (fixed) antenna with no moving parts and no adjustments.

*TRADE MARK

RYAN BUILDS BETTER

North American Rolls Out X-15

The X-15—latest in a series of rocket-powered research aircraft—rolled out as scheduled at North American Aviation's Inglewood, Calif., plant last Wednesday.

The $120-million program is directed at producing a piloted aircraft that can fly at speeds in excess of 3,600 mph and at altitudes of 100 miles and more.

The first powered flight tests are tentatively scheduled for February, 1959. They will be handled out of the AF Research Flight Test Center at Edwards AFB.

The characteristics of the aircraft, which will provide answers to questions on stability, control and aerodynamic heating at hypersonic speeds, were first laid down in 1954 by the National Advisory Committee for Aeronautics—now the National Aeronautics and Space Administration. North American was chosen as the builder of the aircraft. Reaction Motors, Inc.—manufacturer of the rocket motors which pushed the X-1 through the so-called sonic barrier and now a subsidiary of Thiokol—was chosen to build the rocket engine.

Chosen for a mother plane to carry the manned rocket ship was the Boeing B-52 bomber. Earlier X model research aircraft were carried in Boeing's B-29.

The aircraft is composed of eight major subsystems. These are the engine propellant system, the hydraulic system, primary flight control, auxiliary power units, ballistic control rockets, landing gear, air-conditioning and pressurization systems.

The basic engine is the Reaction Motors XLR99 Pioneer, capable of more than 50,000 lbs of thrust. It uses liquid oxygen and liquid ammonia for fuel. First flight will not use the new engines but will use two RMI-XLR-11 engines, one of which was used to power the X-1.

Two auxiliary power units were developed by General Electric, using hydrogen peroxide for fuel. Garrett Corp. makes the air-conditioning and pressurization systems.

Bell Aircraft is building the ballistic control rockets to provide control of the aircraft when out of the atmosphere. Sperry Gyroscope Co. has developed an inertial flight data system to transmit altitude, speed, and angle of attack to both the pilots and the recording apparatus. Lear is building a three-axis flight director attitude indicator.

Dimensions of the X-15 are: Span 22 ft., length 50 ft.; height overall 13 ft., wing swept back 25°, wing area 200 sq. ft.

The wings are a box-type construction with a main spar. There are no movable surfaces in the wing. Inconel X alloy is used throughout the solid nose section to provide a heat sink capable of withstanding temperatures of about 1500° F.

The landing gear is a dual nose wheel with steel skids as a main gear. Gross weight of the X-15 on takeoff will be 31,275 lbs.

First pilot to take the aircraft into flight will be the North American test pilot, Scott Crossfield. The actual research flight to the maximum speed and altitude will be flown by Captain Robert White, successor to Capt. Iven Kinchloe, deceased. AF project officer at Wright Air Development Center is Major Arthur (Kit) Murray who piloted the X-2 research rocket-powered aircraft to an altitude in excess of 90,000 feet.

Air Force, Navy, and NASA are jointly sponsoring the program.

IATA Fare Deadlock

Looms at Cannes Session

The traffic conference of the International Air Transport Association, meeting at Cannes, France, is still deadlocked over the question of a surcharge for jet fares. If an agreement isn't reached by the end of this week, there is a good chance that the question may have to be decided at the IATA General Meeting in New Delhi later this month.

Meantime, a tentative agreement has been reached on increases in fares on the North Atlantic. If approved at the General Meeting—and if the Civil Aeronautics Board can be persuaded to agree to the increases—first class one-way fare New York-London will be raised to $440.

The tourist class fare one-way New York-London will be $320 and the Economy Class fare will be $257. Surcharges on the first class fare will be increased to $60 for a sleeperette, resulting in a deluxe one-way fare New York-London of $500. Berth surcharge will be $85. Increases over present fares would range from $5 to $10.

A tentative decision has also been made at the conference to ease some of the very tight restrictions on food service for the economy class passengers. Carriers will also be permitted to sell drinks to the economy passenger, and also to sell single packs of cigarettes.

JET ORDERS REDUCED

NAL and Delta cutback totals five DC-8s

Two trunk airlines have cut a total of five Douglas DC-8 jet transports from their orders.

National Airlines reduced its order from six to three, and Delta, which had been firm on eight, now has six on order with an option on two.

A Delta official said the change was due to a combination of factors: CAB's philosophy of multiple competition, inadequate fares, general recession and a decline in earnings.

NAL president G. H. Baker said that factors dictating the cancellation were: "The Pan American-National lease agreement (under which NAL proposes to lease PAA Boeing 707s during the winter season) will provide adequate winter capacity on jet equipment. The Panagra interchange will provide DC-8s stopping in Miami and this, with NAL's own equipment, should furnish adequate jet capacity during the summer."

Meanwhile, NAL, with its eye on the upcoming turboprop and jet transports, is offering all its four-engine piston aircraft for sale, and almost all its twin-engine fleet. Listed as available are four DC-6s, eight DC-6Bs, eight DC-7/7Bs, four 1049H Constellations, 12 out of 18 Convair 340/440s, six Lockheed Lodestars (airline configuration) and two executive versions.

NEW JET LEASE DEAL

SAS and Swissair terms involve Caravelles, DC-8s

In an unprecedented deal, Scandinavian Airlines System and Swissair have signed an agreement under which there will be operational leasing and joint maintenance of jet aircraft being purchased by both carriers.

Under the agreement:

SAS has bought four more jet Caravelles from Sud-Aviation which it will lease to Swissair for operation over its short and intermediate range routes. SAS will maintain the planes. This increases its Caravelle order to 16.

SAS will maintain and overhaul the three Douglas DC-8s which have been ordered by Swissair.

Swissair has ordered five Convair 880s, will lease two to SAS, and will maintain all five planes.

The two carriers said the agreement will make it possible for them to effect "sizeable economies" in the operation of their jet fleets. "The joint utilization of workshops and other facilities cannot help but materially benefit both airlines," they said.

The Convair 880s ordered by Swiss-

air at a cost of more than $18 million are long-range versions with more fuel capacity and a range of 3,400 miles compared with 3,000 miles for the basic 880. They will carry 30 first-class and 55 economy-class passengers. Delivery is slated for late 1960.

Back to Subsidy

Panagra blames costs and competition in bid to CAB

Because of cutrate competition and rising operating costs, Pan American-Grace Airways has asked the CAB to return it to subsidy. It estimated a subsidy requirement of $6,818,000 for the year beginning Oct. 3, 1958.

Panagra noted that it has been without subsidy since Dec. 31, 1954, and added that it has made every effort to remain self-sufficient. However, it pointed out that it must now compete with 13 IATA carriers and 10 non-IATA carriers and is expecting four more non-IATA lines to add still further competition. It gave CAB exhibits to illustrate what it termed "substantial disparity between the IATA fare rates and rates offered by the cutrate carriers." The problem has become more acute in the past year, the company said.

Traffic diversion has resulted in passenger revenues declining from $10,086,000 in the first eight months of 1957 to $8,993,000 in the same 1958 period, with load factor dropping from 60% to 53%, Panagra stated, adding that operating costs have increased.

The company said it is in a critical stage of transition to jets at a cost of $27 million, of which it must borrow $18 million. Panagra has entered into an agreement with six banks to obtain the $18 million over the next two years but must maintain satisfactory earnings during the period that the funds are being advanced and expended.

WCA Is First Carrier to Put F-27 In Scheduled Service

West Coast Airlines became the world's first carrier to place the Fairchild F-27 in scheduled service.

Meanwhile, Piedmont Airlines was preparing to start operations with the turboprop in mid-November, and Aloha Airlines of Hawaii became the 16th carrier to place an order for the plane.

WCA opened service on Sept. 28, with the planes being flown by Air Line Pilots Association members while their wage dispute is in arbitration. Three F-27s are being flown, with one operational spare, and 22 of WCA's 42 cities are receiving turboprop service. Schedules will be expanded after delivery of two more aircraft.

Piedmont received CAB approval of a $4,850,000 government guaranteed loan which it will use to purchase eight F-27s and spare parts costing $5,732,636. The loan is at a 5½% annual interest rate and runs for 10 years. The guaranty applies to 90% of the principal and 100% of the interest. Shortly after approval of the loan, Piedmont took delivery of its first two aircraft.

Aloha placed a firm order for two F-27s and took an option on two more. Fairchild now has orders for 74 aircraft, and options have been taken on 22 others.

MATS Contracts

$48 million at stake, CAB approves tariff exemption

The Civil Aeronautics Board passed over complaints of several airlines and approved applications for exemption from tariff filing provisions of the Civil Aeronautics Act to provide airlift contracts between the Military Air Transport Service and civil carriers. Contracts totaling some $48 million were at stake and the airlines holding the awards were faced with having them canceled by the Defense Department if the Board had not favored approval.

In approving the applications, CAB made it clear that it is still far from being satisfied with the manner in which MATS contracts are handled and declared it is determined to "find a proper solution to the current unrestricted bidding procedures used by MATS."

The military contracting procedure has been under fire for some time. Most supplemental carriers claim that they are at a disadvantage in bidding and that the larger scheduled airlines are in a more favorable position in the award competition. The dispute stems from policy in charging for ferrying aircraft for charter flights. The military strongly opposes ferry charges, taking the position that they can never know sufficiently in advance what a specific flight is going to cost.

In approving the exemptions, the Board declared that it was not passing on the complaints that had been aimed at Pan American World Airways and Trans World Airlines. These alleged there were unfair competitive aspects to the bids these airlines had submitted.

CAB dissatisfaction with exemption policy was expressed over a year ago when it conducted an investigation of present procedures. The agency now has a staff working with the Department of Defense in an effort to find a solution to the problem that will satisfy all parties concerned.

Another good reason gourmets say:

The BEST WAY is by TWA

Dave Chasen, noted Beverly Hills restaurateur, approves a great entree.

Sirloin of beef...broiled to your order in flight!

Your Ambassador flight hums toward the evening sun. Dinner is served—a celebrated event on TWA. You begin with cocktails, you conclude with coffee, a choice of liqueurs, and a satisfied sigh. But the high point, an airline innovation by TWA chefs and Dave Chasen, is a culinary masterwork—a tender cut of prime sirloin of beef broiled in flight to individual taste. All this, of course, part of a most pleasant and rewarding trip by TWA Ambassador.

FLY THE FINEST...FLY TWA TRANS WORLD AIRLINES

Transatlantic Jets

Limited service begun by BOAC; PAA's date stands

Less than 24 hours after the Port of New York Authority okayed use of New York International Airport for regular jet operations, British Overseas Airways Corporation rushed its Comet 4s into commercial service on the New York-London route.

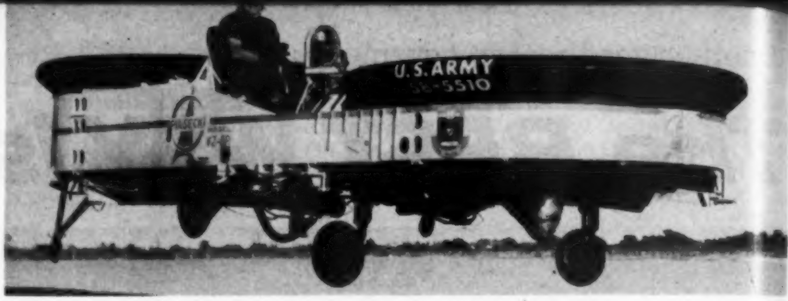
On Oct. 4, some fare-paying passengers, hastily rounded up, were carried, mixed with newsmen and other non-revenue riders. Thus, BOAC became the first to start transatlantic jet service, some three weeks ahead of Pan American World Airways, which held fast to its Oct. 26 starting date for daily service to Paris and Rome.

BOAC made the eastbound crossing in a record 6 hrs. 12 mins. The westbound trip took 10 hrs. 20 mins., including a refueling stop at Gander. The company is operating one flight a week (eastbound Sundays, 6 hrs. 45 mins., westbound Fridays, 10 hrs. 30 mins., with a refueling stop) until Nov. 14, when it plans to start daily service.

BOAC was advertising "First 'Pure Jet' Service Ever to Cross the Atlantic," and described itself as the "world leader in jet travel." It also advertised "You pays your money and you takes your choice . . . of jets," plugging both the Comet and the Britannia turboprop. Pan Am countered with "Faster by Far to Europe" and added: "Only on Pan Am—*daily* jet service from New York to London, Paris, Rome."

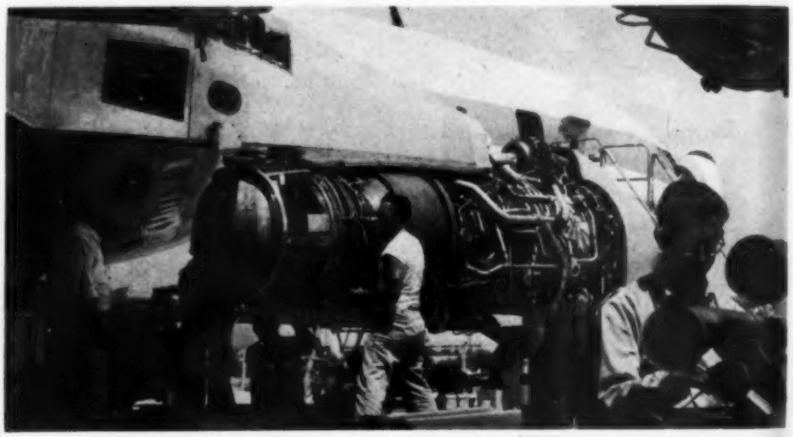
PNYA's approval of Idlewild was not without restrictions. There is to be no night flying over communities, and no daylight flights over populated areas unless made necessary by weather. Rules provide: when wind direction and other weather conditions permit, jets will take off on runways that take the planes initially over Jamaica Bay. If takeoffs cannot be made over water, other runways may be used with certain provisos: turns must be made as soon as practicable away from communities in line with the runway, minimum altitude over any community must be 1,200 ft., power must be cut back just before reaching the first populated area. Takeoffs between 10 p.m. and 7 a.m. must be confined to the two runways leading over Jamaica Bay.

While BOAC termed the rules "very reasonable," a PAA official noted that "both the 707 and Comet operations, as proposed, will be equal to or better than that of current propeller-driven aircraft with respect to community noise in the daytime. This must be equally true during the night hours. It would appear irrational, therefore, for an airline to offer jet service by day and only propeller service at night."



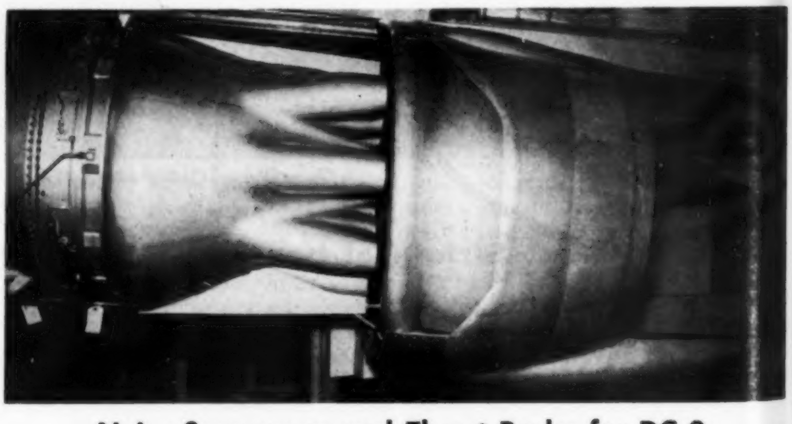
Aerial Jeep Makes First Flight

Piasecki Aircraft Corp. has flown its VZ-8P. Ground testing started last November, and included maneuvering at normal automobile speeds. Powered by two 180-hp Lycoming O-360 four-cyl. piston engines, tethered flight tests started last April, and have been conducted at gross weights to approximately 2,000 lbs. Army R&D contract calls for two flying prototypes; the second is currently under construction.



Thrust Reverser Stops 707 in 2,500 Yards

Boeing Airplane Co. announces its jet engine thrust reverser has stopped the 707 jet airliner in 7,500 ft. after landing. Designed so that they cannot be used inadvertently in the air, the thrust reversers are said to be operable with the engines at full power until speed is decreased to 60 mph, then at reduced power until the aircraft is stopped. In operation, normally open clam shells close to reverse engine blast.



Noise Suppressor and Thrust Brake for DC-8

Combined jet engine noise suppressor and thrust brake developed by Douglas Aircraft Co., Inc. for its DC-8 Jetliner uses an ejector cylinder which extends for takeoff to supplement noise reducing effect of a petal-shaped nozzle. For landing, the ejector is extended, and contoured doors, normally flush with its sides, direct jet exhaust forward. The system is designed to give the equivalent of at least 40% of full power in reverse thrust. In flight, the ejector is retracted.

STATEMENT REQUIRED BY THE ACT OF AUGUST 24, 1912, AS AMENDED BY THE ACT OF MARCH 3, 1933, AND JULY 2, 1946 (Title 39, United States Code, Section 233) SHOWING THE OWNERSHIP, MANAGEMENT, AND CIRCULATION OF AMERICAN AVIATION, published bi-weekly at Harrisburg, Pennsylvania for October 20, 1958.

1. The names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, Wayne W. Parrish, Washington, D.C.; Editor, Wayne W. Parrish, Washington, D.C.; Managing Editor, Stanley C. Jensen, Washington, D.C.; Business Manager, Leonard A. Eiserer, Washington, D.C.

2. The owner is American Aviation Publications, Inc., 1001 Vermont Ave., N.W., Washington, D.C.; Stockholders—more than 1%, Wayne W. Parrish, Washington, D.C.; Leonard A. Eiserer, Washington, D.C.; Eric Bramley, Washington, D.C.; Jay Shuler, Springville, N.Y.; Robert R. Parrish, Chicago, Ill.; E. J. Stackpole, Harrisburg, Pa.; Fred S. Hunter, Los Angeles, Calif.; A. H. Stackpole, Harrisburg, Pa.; Erik Bergaust, Washington, D.C.

3. The known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are: None.

4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

5. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was 43,259.

LEONARD A. EISERER,
(Signature of business manager)

Sworn to and subscribed before me this 3rd day of October, 1958.

HELEN M. DES PREZ,
Notary Public.
(My commission expires November 30, 1961)

. . . News Briefs

. . . Transport

• **New service**—Lufthansa German Airlines will inaugurate on November 6 a twice-weekly de luxe/first-class combination service linking Dusseldorf and Frankfort with New York. One of the flights will originate in Hamburg and one will terminate there. Using an extremely low-density configuration, the Lockheed L-1649 aircraft will have accommodations for 8 first-class passengers forward, 18 de luxe passengers in the center section and four berths in the rear.

• **Name in the news**—Allan F. Bonnalie, assistant vice president-operations for United Airlines, retired on October 1. He had been with United and its predecessors since 1929, and during the period 1945-1952 he served as president of Lineas Aereas Mexicanas, a UAL affiliate.

• **Aeroflot traffic up**—Aeroflot, Russian airline, reported that it handled 62% more passengers in the first seven months of 1958 than in the same 1957 period. "No other nation in the world has achieved as sharp gains in 1958 airline passenger traffic as the USSR," it claimed.

• **BOAC withdraws equipment**—British Overseas Airways Corporation will withdraw all Constellation and Argonaut equipment from service when winter schedules begin on Oct. 26.

• **NWA travel card**—Northwest Airlines is introducing a no-deposit online credit card for passengers, good to all NWA domestic, Canadian, Hawaiian and Alaskan points. Company will pay full commission to travel agents for domestic sales on the cards.

• **AA gets 707**—American Airlines received its first Boeing 707. New York-Los Angeles flights will start Jan. 11; Chicago and San Francisco trips will be added later in the month.

• **Names in the news**—Dudley W. Frost, executive director of the Port of Oakland, Calif., has been elected president of the Aircraft Operators Council. He succeeds Claude F. King, who resigned when he gave up his post as Commissioner of Airports for Cleveland. John R. Wiley, Director of Aviation, Port of New York Authority, succeeds Frost as first vice president and George DeMent, Commissioner of Public Works for Chicago, becomes second vice president. DeMent gave up his directorship, which is now filled by Charles W. Duke, Director of Aviation, New Orleans Aviation Board.

• **Mechanics may reject Board report**—IAM officials are opposing accepting the proposals made to mechanics of six airlines by a Presidential fact-finding board. A vote is now being taken by workers of EAL, NAL, NWA, NEA, TWA and Capital. If vote is unfavorable, a strike vote comes next.

. . . Manufacturing/Military

• **Follow-on contract**—Kaman Aircraft Corp. has been awarded a $10-million Air Force "follow-on" contract for 54 H-43B crash-rescue helicopters. The H-43B is powered by Lycoming's 825-shp T-53 turboshaft engine.

• **New helicopter service**—Helicopter Services of Buffalo has launched western New York State's first commercial helicopter service. Using one Bell G-2 Trooper and a Bell 47-J Ranger, the company plans to provide lease and charter service in the area.

• **A long line**—Hardman Tool & Engineering Co. has produced its 70,000th airline passenger chair, one of a model specially designed for use in American Airlines' new fleet of Boeing 707s and Lockheed Electras.

• **No Northrop merger**—Northrop Aircraft has terminated negotiations which had been in progress for a merger with American Bosch Arma. Northrop president Whitley C. Collins said the action was taken because of failure to arrive at satisfactory settlement of several points.

• **Overhaul period upped**—Time between overhauls for the Pratt & Whitney J57 engine has been stepped up to 1,400 hours by the Air Force. It marks the biggest jump so far given the J57, which first was installed in 1951 in a B-52 prototype, and brings between-overhaul time for the engine nearer the 2,000-hour record held by piston engines after 23 years of experience.

• **Lockheed in Mexico**—Lockheed Aircraft Corp. has organized Lockheed, S.A. in Mexico to work with industrial leaders and the government on a program of aviation development. D. J. Haughton, Lockheed's executive vice president, is board chairman of the Mexican company, and Dudley E. Browne, Lockheed vice president and comptroller, is president. Alberto Ortego is resident manager in Mexico City.

EMPLOYMENT

THE BULLETIN BOARD

Undisplayed Advertising: $2.00 per line, minimum charge $6.00. Cash with order. Estimate 30 capital letters and spaces per line; 40 small lower-case letters and spaces per line. Add two lines if Box Number is included in lieu of advertiser's name and address. **Displayed Advertising:** $20.00 per column inch. Space units up to full page accepted in this section for classified-type advertising. Forms close three weeks preceding date of issue. Address all correspondence to Classified Advertising Department, American Aviation Publications, 1001 Vermont Ave., N.W., Washington 5, D.C.

Help Wanted

WANTED: Experienced Helicopter Mechanics and Inspectors. Age 21-45. Pay commensurate with experience. Liberal fringe benefits. Write Box 839, Ozark, Ala.

AIRCRAFT FOR SALE

Reduced for immediate sale. Lockheed Lodestar. Completely equipped. Oxygen, rotating beacon, many extras. $69,750.00. Fruin-Colnon Contracting Co., 1706 Olive St., St. Louis 3, Mo. Direct inquiries attention H. V. Gausmann, Pilot, or R. W. Christmann, Equipment Manager.

IMMEDIATE DELIVERY
from our select stock
SPERRY
Auto-Pilot & Gyrosyn Compass, Complete Systems or Components.
ASTRO AVIATION, INC.
5733 Cahuenga Blvd. North Hollywood, Calif.
Phone STanley 7-8622

FOR SALE
DC-4's
B & E Models
Fully Convertible
Overseas & Domestic
Financing Available
United States Overseas Airlines Inc.
Chrysler Bldg., New York, N. Y.
Telephone YUkon 6-6685
Cable: USOALINES NEW YORK
TWX NY 1-3486

FULL COLOR PRINT Boeing B-47 in Flight, Authentic Reproduction of Official U.S. Air Force Photograph. Size 20 x 30. Price $1.00 Ppd. Send Check or Money Order to: **Preferred Prints Department A, Box 408, Times Square Station, New York 36, New York.**

FOR SALE
C-46F AIRCRAFT
Passenger and Cargo
With or Without
T-Category Kit Installed
Immediate Delivery
The Flying Tiger Line Inc.
Burbank, Calif.
Call or Cable
Fred Benninger
Executive Vice President
Tel: Stanley 7-3411 Cable: Flytiger

AN FITTINGS & HARDWARE

Stainless, Aluminum, Brass, Steel All sizes—immediate delivery from world's largest shelf stock. Buy direct from manufacturer. Lower prices—quicker service. Send for free wall charts showing complete line of AN & MS fittings and hardware. We machine parts to your own print; also, we sell AN & MS Forgings.
COLLINS ENGINEERING CORPORATION
9050 Washington Blvd., Culver City, California

FOR SALE
1 Douglas B-26-B-56-DL
1 Douglas B-26-C-40-DL

Military Models, Low Airframe and Engine Time, New Tires and Tubes, Batteries, Plugs and New Fabric Elevators and Ailerons.

Excellent Condition—Ready to Fly.

CONTACT
B. J. Waddell, Chief Pilot
A. H. Beidel, Purchasing Agent
Potash Company of America
P. O. Box 31
Carlsbad, New Mexico
Phone TUxedo 5-2111

AD INDEX

NEA Stewardess Jane Vinal and WWP at Boston.

—EN ROUTE

Wayne W. Parrish

In and Out of the Soup With Northeast

In my hobby of collecting airports, Northeast Airlines has presented a tough challenge. It serves something like 32 airports north of New York and most of the services operate out of New York or Boston to the end of a line and back again. So a lot of individual round-trips are necessary.

I've hit most of the new airports en route to some place, even though the routing was indirect. But with Northeast I've had to set aside time merely to fly north on those many segments and turn around and fly back again.

In 1956 I cleaned up Maine. Last year I finally hit Berlin, N.H. on the second try. At this writing I've covered the system with the exception of Athol-Orange-Greenfield, Mass., and Pawtucket-Woonsocket, R.I., each of which requires a round-trip out of New York. Northeast not only has a few seasonal stops, but is plagued by bad weather a lot of the time.

Here is a report on my last two excursions:

In August, 1957 I took a local to Boston by way of Worcester and Fitchburg. At Worcester, George Bean, airport manager, who has since become manager at Newcastle County Airport serving Wilmington, Del., met me and tried to persuade me to stop over and try out the Stockholm restaurant which he said was the finest dining room in any airport in the country. But I couldn't take the time.

At Fitchburg a letter was waiting for me from Gordon Barrington, station manager, who had left early that day for Tampa, Fla., where he was opening up as station manager at NEA's new stop down there. But Tom Foley, chairman of the airport commission, was on hand to greet me. Capt. R. E. Worth, 1st Officer D. B. Carter and Stewardess E. T. St. Germain, gave me a good flight through new country.

WWP GREETED at Worcester by George Bean, then airport manager there.

At Boston I was connecting with the local to Berlin, N.H., via Concord and Laconia. I had tried this once before but the weather kept Berlin below minimums. And it almost did again on this trip. We just made it.

Welcomed by City Manager

At Concord I was welcomed by City Manager Woodbury Brackett and d.s.m. Wilbur "Doc" Hardy. At Berlin, J. W. Nevers, station manager, shook hands during the quick turnaround. Capt. I. Joseph, 1st Officer E. C. Butler, and Stewardess A. J. Smith were on the flight, which, incidentally, was full-up both ways.

At Boston, Ann Wood, Northeast's efficient public relations gal, had me participate in a minor way in the airline's 24th anniversary, as the photo on this page shows.

It was almost a year later, this past July 27, before I was able to knock out another NEA stop. This one was a seasonal, Newport, Vt., within ten miles of the Canadian border, in a very attractive summer resort area which features a lake with the jawbreaking name of Memphremagog. I left Washington on American's #308 at 8 a.m., didn't reach Newport until early afternoon, and didn't get back to New York until after dark. The weather was lousy—period. (Wonder if the sun ever does shine in New England?) On AA, Copilot Bob Ennis, a regular reader of this page, came back to say hello.

The NEA DC-3 got away over an hour late, first because of a mechanical which necessitated change of planes, and next because of traffic control. Capt. P. H. Clancy, who has a real Down East accent, did a fine job of keeping passengers informed of reasons for the series of delays. The other crew members were 1st Officer J. A. Rapsis and Stewardess C. A. O'Connor.

In the Soup

We were in the soup most of the way to Montpelier-Barre, Vt. On hand there were Ed Knapp, state aeronautics director; Mayor George Estevill of Barre, Leighton White of NEA, whom I had met several years ago in Augusta, Me., and Mrs. White; and Edmando Roberti, airport manager. Also had a chat with Mike O'Seep, of CAA, who had just returned from a European trip and had taken the advice given on this page several years ago to see those gals wrestling in the mud in a Hamburg nightclub. (He said they lived up to the advance billing.)

NEA'S 24TH birthday cake made to resemble the operations tower at Logan International Airport, Boston. Chef was William Leeman of the Sheraton-Plaza. WWP gets a piece of cake from Stewardesses Jette Marcell and Joan Carroll. (Birthday was Aug. 11, 1957.)

The crew never did get anything to eat on that trip, but I bought a sandwich in the snack bar and ate it on the way to Newport. Knapp went along with me. There was a fair ceiling and visibility at Newport but I was disappointed not to see the area in sunshine. It must be very pretty.

Major John Natole was at the airport to extend an official welcome, accompanied by Franz A. Hunt, publisher of *The Newport Daily Express*. John Delaney, station manager, told me his traffic for 1958 would have equaled last year's had not the New England weather been so bad. Last summer NEA carried about a thousand passengers out of Newport during the three months of service. The airport, incidentally, comprises more than 1,200 acres. It's larger in total area than LaGuardia. O. S. "Cy" Searles was chiefly responsible for this project.

The flight back was routine except for traffic delays in the New York area. The ceiling was 'way down.

I spent the night at the Travelers' Motel near LaGuardia. Very convenient, but I had the bad luck of having a bum air-conditioning unit; simply wouldn't turn out any cool air.

Northeast has done a good job of serving all those New England towns with short-haul routes, but most of the network should be on subsidy. It is expensive to serve. There is no possible way to break even on the bulk of the stops. CAB should either put the local network on subsidy, along with local carriers, or relieve NEA of the burden and tie them into an existing local carrier pattern.

Look for Texaco's terminal-type service at these airports

The Texaco sign at these terminal airports identifies the source of the most dependable business aircraft service available. Texaco "terminal-type" service offers complete facilities for everything from a routine check to a complete overhaul—on aircraft up to CV-440 size. Service is fast, courteous and competent, and is usually available on a 24-hour basis. Texaco airport dealers have the red carpet out for you always, with weather information, maps, restaurants, stop-over accommodations—you name it!

At these airports, you can be sure of first-rate aircraft maintenance—and you can rely completely on the premium quality of Texaco products. Take a tip from the airlines. They are sticklers for maintenance and operating perfection, and, *during the last 23 years, more scheduled revenue airline miles in the United States have been flown with Texaco Aircraft Engine Oil than with all other brands combined.*

And for maximum convenience as well as complete confidence, fly with a Texaco Credit Card.

The Texas Company, *Aviation Sales Department,* 135 East 42nd Street, New York 17, N. Y.

TEXACO

LUBRICANTS AND FUELS FOR THE AVIATION INDUSTRY

Circle No. 134 on Reader Service Card.